ELECTRICAL REVIEW

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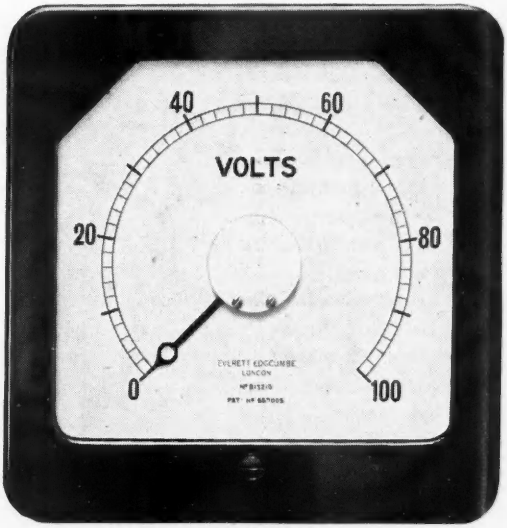

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ELECTRICAL REVIEW 7th NOVEMBER, 1952

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Efficient Production

WHEN there is general acceptance of a set of ideas the organization of conferences to reiterate them may seem a work of supererogation. But acceptance does not necessarily mean action and frequent spurs are needed to secure it. That is the justification of the Industrial Productivity Conference, under the chairmanship of Dr. Percy Dunsheath, arranged by the British Electrical Development Association last week. The axioms presented were that improved productivity was essential to the maintenance or betterment of this country's standard of living and that the pre-eminent agent in this improvement was electricity. The electricity supply industry has always sincerely believed this—even before the blessed word "productivity" displaced "industrial efficiency"—and a great deal of E.D.A.'s work has been aimed at bringing industrialists to a fuller realization of the truth. The electrical manufacturing industry itself has become a shining example of efficient production by "taking its own medicine". As Col. B. H. Leeson pointed out at the conference, the industry is its own "guinea pig" in the trying-out of new ideas.

It may be wondered why the serious disparity between electrical horse-power per worker in the United States and in this country still persists or even widens. There are several reasons but the chief one is financial. Sir Norman Kipping pointed out that more power and more mechanization meant more investment and that in turn meant more saving. Unfortunately the present level of taxation discourages saving or makes it impossible. Again, we are being compelled to export a great part of the capital goods which we produce, thus in effect equipping possible competitors in the world markets.

When manufacturers find it possible to embark upon modernization of their plants they want to be sure of a regular supply of power. For this reason the British Electricity Authority must

anticipate demands many years ahead. Col. Leeson insisted that nothing less than 2,000 MW of generating plant a year must be installed and Lord Citrine said that if they were held to the present limit of 1,550 MW load shedding in severe weather would go on indefinitely. Lord Citrine anticipated possible suggestions that so much plant could not be profitably employed by mentioning that the system load factor was 50 per cent as compared with a utilization factor of between 20 and 30 per cent usual with industrial equipment. (That, incidentally, showed the necessity for the better use of productive plant.) He also discounted the idea that any significant improvement could be achieved in the plant position by restricting non-industrial uses of electricity. It is to be hoped that the proceedings of the conference will be seriously studied by the Treasury and other Government Departments concerned, all of whom were represented on the occasion, and that the industrial delegates—management and labour (Sir Vincent Tewson of the T.U.C. was there)—will impart to their associations and firms the stimulus which they must have received.

CO-OPERATION

It was suggested by the Ridley Committee that co-operation between the coal, gas and electricity industries should be encouraged by the setting up of a joint committee under an independent chairman. In the course of the fuel and power debate in the House of Commons last week Mr. Geoffrey Lloyd, Minister of Fuel and Power, said that he was doubtful whether greater co-operation would be achieved by this means. He preferred joint consultations between the chairmen of the national boards and himself. Mr. Lloyd is probably right. One principal function of his Ministry is to secure co-ordination and already there is a super-Minister (Lord Leathers) who is supposed to take a hand in the co-ordination of these industries, as well as transport.

CONFLICTING THOUGHTS

Mr. Noel-Baker, former Minister of Fuel and Power, in the same debate, was a strong champion of electric lighting, railway electrification and vacuum cleaners and washing machines. But, ably supported by Mr. Nabarro, he did not like the idea of electricity for space heating, cooking or water heating. How do they think that the electricity authorities are to fill in their "valleys" and pay their way if the bulk of the domestic load is denied them? And yet Mr. Nabarro was insistent that the B.E.A. should be given first call on capital investment resources to enable it to carry out an 1,800 MW a year plant programme. The two ideas do not match.

PROGRESS REPORT

The wide range of subjects covered by the I.E.E. Supply Section was made very clear by Mr. C. M. Cock in his chairman's address delivered last week. His outline of most recent actual and projected developments in electricity supply (which mirrors manufacturing advance) was in effect a progress report. It should serve as a desirable correction to any vocational tendency towards over-specialization with consequent loss of perspective and narrowing of professional interests.

ELECTRICAL WHO'S WHO

The second edition of this useful reference book now available contains brief biographies of over 4,000 men and women in all branches of the electrical industry and profession. Copies are obtainable at 12s 6d (postage 8d) from all booksellers or the Publishing Dept., Dorset House, Stamford Street, London, S.E.1.

Electricity and Productivity

Proceedings at E.D.A. Conference

THE Industrial Productivity Conference, organized by the British Electrical Development Association, and held at the Institution of Electrical Engineers, was opened on 29th October by Dr. PERCY DUNSHEATH, president of the Association. Dr. Dunsheath said that no matter what phase of increased production was discussed, sooner or later the conclusion was reached that at rock bottom there was electrical development. There could be no surer foundation on which to build up production than was to be found in that well-worn but still eloquent term " a cheap and abundant supply of electricity."

In an address on " The National Need for Greater Productivity," Mr. A. R. W. Low, Parliamentary Secretary to the Ministry of Supply, said that the nation's standard of life, defensive strength, exports and social services all depended on greater productivity. If overseas sales were to expand in a competitive world, costs had to be kept down and quality up. The problem for each manufacturer was to produce the maximum quantity with the minimum men and materials.

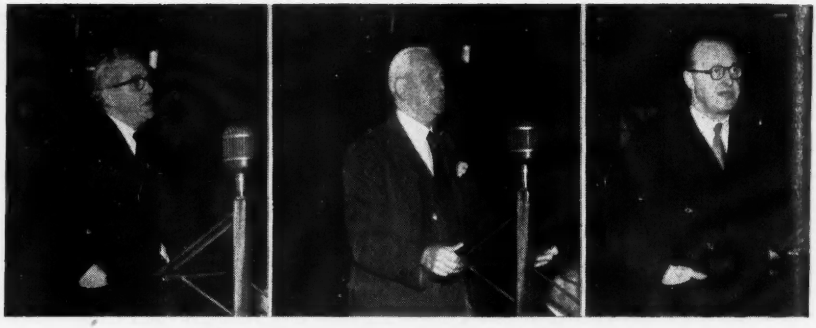
Many raw material difficulties were now diminishing. There were, however, newer difficulties which had not been present three years ago. Competition had increased overseas and more countries had either closed or partly closed their doors to British goods. These difficulties must stimulate industry to ensure that materials were fully used and that each worker achieved his maximum output.

It was encouraging to see the amount of mechanical handling equipment which had got into industry but there was scope for more outside the factories. There was need for further study of the vital problem of shortening time of production.

The introduction of new machines and methods would only have the desired effect if the management was able to convince the workers of the purpose and advantage of each individual change.

Sir NORMAN KIPPING (director-general, Federation of British Industries) said that nobody could do much about raising productivity if he could not get the raw materials for his product, if he could not get coal or electric power or gas, or if he

Dr. P. Dunsheath, Mr. A. R. W. Low and Sir Norman Kipping



Col. B. H. Leeson, Lord Citrine and Sir Vincent Tewson

was prevented from investing in buildings or plant to match the most productive processes he could devise.

Electricity was the very lifeblood for the arteries and veins of our productive being. But more power and more mechanization meant more investment and the growth of productivity was being directly discouraged, and to a large extent prevented, by levels of taxation which prohibited saving and which offered no rewards attractive enough to encourage experiment and the taking of calculated risks.

Every opportunity must be taken of increasing the efficiency of existing resources. Could we afford, so long as any cuts remained, to encourage domestic consumption or use electric power inefficiently?

The threat of restrictions against the use by industry of private generating plant should be removed. Firms were not going to install private plant unless they were sure it would pay. The Authority should have no right to be the final judge in this matter.

There should be closer collaboration on technical and tariff problems, for a wrongly conceived tariff could do infinite harm in compelling developments to take forms which were basically faulty.

Col. B. H. LEESON (President, Institution of Electrical Engineers and director of B.E.A.M.A.) said that a capital investment policy which would cover some 2,000 MW of electrical plant a year was an inescapable necessity for sufficient productivity and economic recovery. To improve still further the productivity of industry, it was necessary to increase the use of electrical plant and appliances. The electrical manufacturing industry was continuously progressing as a result of invention and research, and the development of new plant and equipment for better production. The placing of 1 kW of electrical energy in the hands of a man was equivalent to increasing his capability of working by about ten times.

The greater use of electricity and of the application of science in other directions called for a higher standard of education and of training in industry at every level.

Lord CITRINE (chairman, British Electricity Authority) pointed out that if decisions taken by the Government resulted in a curtailment of supply of generating capacity in this country, the consequences must be serious and even disastrous some years from now.

The B.E.A.'s plant programme was decided upon only after the most careful consideration of all the relevant facts. It was a rising programme, requiring by the year 1960 over 2,000 MW of plant. The manufacturers were confident that they would be able to carry out the programme.

The programme had also been criticized on economic grounds. Some had recommended both curtailment of the programme and restriction of the sales of electricity. To curtail the overall consumption of electricity would seriously affect the economics of the industry. Only with a huge output could the unit price be kept down. Answering Sir Norman Kipping, Lord Citrine said they could not afford not to encourage domestic consumption.

If capital investment was justified on

machine tools and industrial plant with a load factor of between 20 and 30 per cent, it was unreasonable to criticize investment in generating plant with a load factor of 50 per cent. The greatest single contribution towards solving the peak load problem of the electricity supply industry and reducing the overall cost of industry, would be a wide extension of double-shift working.

It was expected that a minimum of 1,250 MW of plant would be installed here in 1952. The estimated commissioning in the United States was over 9,000 MW. This disparity could only be diminished by providing British industry with an adequate electricity supply. Such matters as load control, price regulation and other methods for curtailing the use of electricity at peak periods could not become effective for many years and would only touch the fringe of the problem.

If the amount of generating plant to be commissioned was limited to 1,550 MW a year, and demand increased at the rate estimated, load shedding in the event of severe weather would go on indefinitely, with consequent loss to industry and the stultification of a great public service.

Trade Union Attitude

Sir VINCENT TEWSON (general secretary, Trades Union Congress), who opened the discussion, said that sometimes the argument was used that by taking part in a campaign for increased productivity men could do themselves out of a job. That line of reasoning was not admitted in the trade union movement. On the contrary, the fear of unemployment and the existence of unemployment were things which made greater productivity in industry all the more necessary.

The trade union movement took the line that if there was a shortage of fuel and power, what there was should be used effectively. The electrical industry, like others, he said, must consider the question of costs and quality and produce plant which would assist in the economic use of power.

Mr. J. O. KNOWLES (Institution of Production Engineers) said that there was a shortage of application engineers. It took about twelve years to turn a youth into an application engineer who had sufficient experience and self-reliance to advise men in other industries on the application of electrical power to their industries.

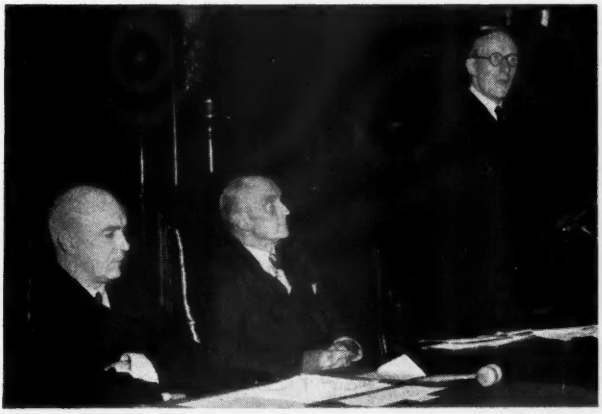
Mr. J. F. FIELD (S.E. Scotland Division, B.E.A.) observed that a serious fuel problem could arise if there was a very large increase in generating capacity. This could only be solved by improved fuel efficiency. He explained with the aid of diagrams how the problem could be dealt with.

Mr. R. A. S. THWAITES (N. Western Electricity Board) urged the necessity of exporting products which involved the minimum amount of raw material and the maximum amount of work and skill.

Mr. T. ECCLES (N. Western Regional Board for Industry) said that they must give thought not only to the question of production in relation to the electricity supply industry, but to the general question of the efficiency in all industries and the development of new industries.

Mr. D. MCNICOLL (British Timken, Ltd.) said that if increased productivity was wanted, the Government must have a

Mr. C. T. Melling, Mr. H. Nimmo and Mr. E. R. Wilkinson



taxation policy and a building policy which would encourage manufacturers to put in the necessary plant and house it. He urged greater standardization. Industrialists wanted to be able to replace a burnt-out electric motor from the nearest source, which called for standardized dimensions.

Conference Luncheon

A conference luncheon was held at the Savoy Hotel, the principal guest being the Minister of Fuel and Power, Mr. Geoffrey Lloyd. In proposing the toast "Greater Productivity," Mr. LLOYD said that in the last fifty years this country had doubled its national income and it was consuming only one-third more coal. That meant that for every £1,000 of national income we were using only 60 tons instead of 100 tons. This was the result of the tremendous economy achieved by the steam turbines operating in the great central power stations of this country.

Industrially and politically a tremendously skilful job had to be done by the people of this country in the next generation if we were to keep the flag flying in industry and throughout the world. He believed that electricity was one of the great agents which must be used for the purpose.

It was often said that in this country we ought to get up to the American standard of h.p. per worker but really we ought to surpass that standard if we could. In a small country, dependent on a really skilful industrial job—as this country was—it was the skill that was required and the necessary power behind it.

Dr. P. DUNSHEATH, who presided, in replying and also proposing the toast of the guests, said that there must be ruthless action in factories where manpower was wasted. This applied particularly to the small factories. The machines themselves had to be modernized on a much more rapid scale than in the past.

He stressed the necessity for organizing education, through and in industry, in such a way that it was got over quickly. There were 20 universities and some 200 technical colleges in which there was a very sympathetic approach to industrial problems, and this was for the future prosperity of British industry one of the brightest spots, for those organizations were preparing the men who would run industry in the years to come.

Lord BRABAZON OF TARA (a past-president of E.D.A.), responding to the toast, said that to be efficient, to be able to export throughout the world, this country must have its workshops equipped in a thoroughly up-to-date manner, and at present most of the money which should go towards that equipment was taxed. The Treasury had found an ideal way of ruining every industry in the country!

Electricity's Contribution

After the luncheon, the Conference was resumed under the chairmanship of Mr. H. NIMMO (chairman of the E.D.A. Council).

Mr. E. R. WILKINSON (commercial manager, B.E.A.), speaking on "Higher Industrial Production and the Contribution that Electricity can make," said that the immediate requirement was more efficient and harder work, but this alone would not suffice; the long-term solution of our difficulties was to be found in increased mechanization through the greater use of electricity.

The shortage of generating plant, which was the inevitable consequence of the war-time interregnum in construction, had contributed to our post-war difficulties, but it was fair to say

Mr. Geoffrey Lloyd, Lord Brabazon and Col. B. H. Leeson

that the manufacturing difficulties and other physical impediments had now been largely overcome.

The power shortage would indeed be over and the need for load shedding and load spreading entirely eliminated if industry generally operated on a two-shift basis.

In spite of enormous strides in recent years in the design of machine tools, there was still need for a revolutionary change in the attitude towards the use of power in our factories. So far from curtailing the amount of capital investment in power-producing and power-using equipment, the allocation of money for this purpose should be increased. This was the only way in which productivity could be improved and cost reduced.

Advice to Industrial Consumers

Speaking on the service which the Area Boards could give in advising and assisting industrial consumers, Mr. C. T. MELLING (chairman, Eastern Electricity Board) said that Area Board officers were already in contact with manufacturers and full use should be made of those existing contacts before creating any new machinery for giving advice on productivity. Area Board officers were called upon by manufacturers for advice on mains and substation problems in the factories, and the commercial officers were in very close contact with industry on the provision of lighting, heating, the use of electrical plant and line installations.

In some undertakings there had been for many years industrial power engineers who had dealt with industry on a very helpful basis. He suggested that the industrial power engineer should be an important feature of electricity supply organization.

In the subsequent discussion Mr. W. GILCHRIST (Merseyside and North Wales Electricity Board) suggested that Area Board officers should take every opportunity of going into factories and looking at the production. While offering all possible help, however, they must never enter the field of the specialist in particular items of production.

Dr. S. J. FLETCHER (Magnesium Elektron, Ltd.) said that if the cost of electricity was too high increased use could not increase productivity. There had been many references to the domestic consumer, but electricity for industry, on the competitive success of which people relied for their work, must come first.

Mr. J. B. LANCASTER (Lever Bros., Port Sunlight, Ltd.) said that there were two principal ways in which electricity could be used to increase productivity: one was to speed up and facilitate the operations of an individual worker, and the other was to replace a worker entirely by producing a mechanism which would be driven by electrical power and do the job which the worker had previously done. The second was the more important.

Mechanisms engineers—or applications engineers—were most valuable in industry to-day, and should be encouraged. There was a great need for improvement in the training of apprentices and the brighter ones should be trained to become mechanisms engineers.

While trade union leaders might recognize the need for increased productivity this did not always apply to the local branch. Restrictive practices were still a handicap.

Mr. A. W. FERGUSON (Electricity Board for Northern Ireland) said that unless the Government of Great Britain could be persuaded to give all the money required to build the generating stations, as the Northern Ireland Government did, they were playing with the question of increased productivity.

Mr. WARREN (S. Wales) said that the appointment of industrial power engineers should be made on a sub-area basis, particularly in those areas which had a strong industrial bias. It was necessary to offer the inducement of better off-peak terms to industrial consumers.

Mr. J. A. SUMNER (Eastern Electricity Board) said that if in fact three times as much electricity was used per worker in the United States, we ought to try to find out how it was done—it was not easy to use three times as much power. There was some danger in suggesting that increased production by means of electricity must necessarily mean a greater use of electricity. There were many cases where an electrically-driven machine properly installed would save the manufacturer money and actually result for the time being in less use of electricity.

Mr. N. PATTERSON (Birmingham) said that consumers were still suspicious of a nationalized industry. Speaking as a district manager, he desired to dispel that impression.

Mr. Wilkinson briefly replied to the points raised in the discussion.

Mr. V. W. DALE, general manager and secretary of E.D.A., opened the second day of the Conference by describing E.D.A.'s campaign to electrify the factories of Britain in the 1950's and to give more power to the worker. He stressed the need for a power sales force to advise industrial consumers on the most efficient and economical application of electricity to their machines and tools.

He urged the Area Boards to take the campaign into the factories, to managements and works discussion groups, to local branches of the engineering institutions and trade associations, and to technical colleges and schools. Already the Council had been in touch with the principals of 60 or 70 technical colleges in the hope that courses could be included in the curricula dealing with subjects in the eight study books which had been produced. These books were:—" Higher Industrial Production with Electricity," " Lighting in Industry," " Materials Handling in Industry," " Electric Resistance Heating," " Industrial Electric Trucks," " Electric Motors and Controls," " Induction and Dielectric Heating," and " Process Integration and Instrumentation." They hoped that the whole of this series would be promptly placed in the hands of all people on the Boards' staffs who had the responsibility of advising industrial consumers.

The Council was also encouraging the presentation of general and special electricity and productivity papers before engineering institutions and associations. They had also produced the first of a series of productivity films—" The Case for Handling." The Mutual Security Agency had obtained a master copy and, after the sound track had been translated, the film would be circulated throughout Europe. Mr. Dale said they already had an assurance of interest in the campaign from more than 30 national trade associations.

Mr. W. ROBINSON, B.Sc., A.M.I.E.E., F.I.E.S., spoke on " Lighting for Greater Productivity." He said that fluorescent lighting and a wider range of equipment than ever before were now available. The E.D.A. book " Lighting in Industry " would prove a useful guide for industry in general and for those who advised on and installed electric lighting.

In the ensuing discussion Mr. J. V. GIL (F. Perkins, Ltd.) advocated the removal of purchase tax from fluorescent lamps.

Mr. V. W. Dale

Mr. J. I. Bernard

Mr. N. F. PATTERSON (Monsanto Chemicals, Ltd.) said that even intensities of lighting enabled a man to maintain his output and when wastage was removed, productivity automatically improved.

Mr. E. R. WILKINSON, commercial manager, B.E.A., said one of the most important factors in regard to lighting for many years was the recommendation of the Ridley Committee that the purchase tax on fluorescent lamps should be removed.

Mr. A. N. IRENS, South Western Electricity Board, said that much of the difference in industrial electricity consumption between the United States and Great Britain was in lighting. Americans used twelve times as much for lighting as we did.

Mr. E. A. FOWLER (chief commercial officer, Eastern Electricity Board) advocated better use of installation possibilities.

Mr. E. M. ACKERY, A.F.C., B.Sc. (Eng.), M.I.H.V.E., speaking on " Industrial Electric Heating," said that while electricity was not cheaper on a B.Th.U. basis than solid fuel, gas or oil, its use as a heating medium had come about because a therm of electric heat was a therm of clean, useful, controllable heat, nothing but heat, heat at any temperature and heat in any position, available when it was wanted and able to be switched off when not wanted. Those features more than justified the use of electricity for heating. They led to increased productivity: directly by reduction in labour costs, numbers of rejects, reprocessing, subsequent cleaning, pickling or machining and by a higher quality of product, and indirectly by improved working conditions, reduced maintenance costs and saving in space.

Mr. W. E. SWALE (North Western Electricity Board) said the method of doing the work might have changed but the

fundamental principles of bringing about the necessary climate of opinion in industry remained as they used to be—argument, persuasion, example and propaganda.

Mr. F. C. ORCHARD (Eastern Electricity Board) said that if more electrical energy were used, more generating plant would be required. More importance should be attached to the use of modern appliances which would enable a better job to be produced in a shorter time and with the use of less electricity.

Mr. A. O. JOHNSON (chief commercial officer, North Western Electricity Board) said that in the first four years of nationalization all the staff had been heavily engaged upon reorganization and standardization, which was valuable but did not sell electrical energy, and he asked how far the authorities were prepared to go in supplying the personnel required to conduct the campaign.

Mr. R. ECKERSLEY (Midlands Electricity Board) believed that a sales campaign could be run concurrently with a productivity campaign.

Mr. L. LANDON GOODMAN, B.Sc. (Eng.), A.M.I.E.E., A.M.I.Mech.E., speaking on "Materials Handling—a New Technology," asserted that 80 per cent of the cost of some products was accountable purely to bad handling and that in the heavy engineering industry as much as 50 tons of material might have to be moved for every single ton of finished product. On the basis of an £8 wage for a 40-hour week one horse-power of human energy cost 40s, one horse-power of horse energy in London cost 2s 6d, and one horse-power of electrical energy 1d.

Mr. E. A. FOWLER said that the information provided by E.D.A. must be got down to the members of the staff whose task it was to meet consumers.

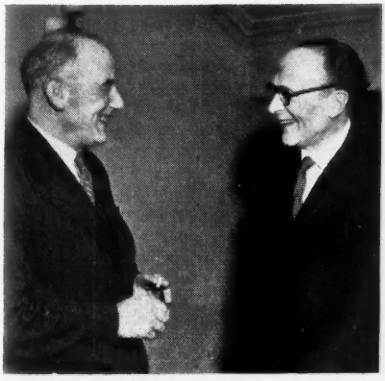
Mr. J. ECCLES (chairman, Merseyside and N. Wales Electricity Board) said that Boards could provide their staffs with practical information about materials handling by using such equipment in their own stores.

Mr. R. Y. SANDERS (deputy commercial manager, British Electricity Authority), said that there were about 100,000 small factories which had no means of obtaining specialized information except through the Area Boards.

Mr. F. W. POULTNEY (Yorkshire Electricity Board) said that no reference had been made to agriculture but it was the largest industry in the country. Many rural electrification schemes were running at a loss, and efforts must be made to ensure that the money spent brought in a return.

Mr. J. I. BERNARD, B.Sc., M.I.E.E. (chief technical officer, E.D.A.), who summed up the work of the conference, pointed to the general agreement that there was a use for electricity in every phase of production, and said that there was great scope for efforts by Area Boards and their staffs who were in contact with consumers with the object of increasing productivity. More industrial power specialists would be of great value, but it would take time to provide them. In the meantime the industry must do the best it could with its existing personnel.

Mr. J. S. Pickles (S.W. Scotland Electricity Board) and Mr. W. S. Sawtell (S.E. Scotland Board)



Salvaging Steel Scrap

THE British Iron and Steel Federation last week gave a private showing of a new film, which is one of a series dealing with the drive for salvaging scrap iron and steel. The film, "New for Old," shows the many sources of iron and steel salvage, with particular emphasis on the work which is being done by the Services in the recovery of scrap.

Capt. Leighton Davies, chairman of the Scrap Committee, presided, and explained that although scrap from home sources had shown a rise at the rate of 300,000 tons per annum during 1952, as compared with last year, it was not expected that supplies from overseas would increase, due mainly to the rising demand for scrap by German works. The need, therefore, for maintaining every effort in salvaging home scrap was as great as ever.

VIEWS on the NEWS

By REFLECTOR

WHAT is a fair rent for a substation site? I have always thought that if the owner of the land was interested in securing a supply of electricity he should either let the authority have the plot for nothing or charge a "peppercorn" rent. The point has risen at Cambridge where the City Council Housing Committee is seeking to charge £4 or £5 a year for substation sites while the Eastern Electricity Board thinks 5s or 10s enough. In a letter the Board said that "rents in excess of those regarded by the Board as reasonable could lead to the need for the Board to require a capital contribution towards the cost of making the supply available at the particular housing estate in question."

* * *

Unorthodox fuels are fairly frequently used in power stations. Usually the fuels are waste products, such as sawdust or bagasse (sugar cane refuse), but in the nineteen-thirties it was reported on more than one occasion that Argentina had been consuming grain in this way. Now the *Electrical World* (New York) states that the Union Electric Co., of Missouri, recently burned some Dutch mustard seed which had been condemned by the American Department of Agriculture. This is said to have produced 20 per cent more heat than the equivalent weight of coal but as there was only a ton of seed the effect on the annual thermal efficiency figure will be negligible. The *Electrical World* assures the coal producers that their product is pretty safe; uncondemned mustard seed costs 90 cents (over 6s) a pound.

* * *

It is a long time since depredation of wood poles by woodpeckers last came to my notice. I suppose it still goes on though, I hope, not to such an extent as in some parts of the United States. At Harwinton, Connecticut, the local power company has reported damage to 64 pine poles carrying a 115 kV line. Nearly half of them had to be replaced and the others were repaired by the use of "osmoplastic compound." Some poles had as many as eight holes and in a few cases the poles were almost completely bored through. The birds responsible are said to be pileated woodpeckers; possibly a stronger adjective was used by the company's transmission department.

* * *

Recently at Birmingham a woman was killed when, it is believed, an electric fire fell into a bath in which she was washing clothes. Her husband, who presumably went to her aid, was also killed. It is reported that a neighbour who found them lying in a pool of water was spoken to by the woman. It thus seems very probable that the immediate application of artificial resuscitation might have saved her life if not that of her husband. In factories using electricity the display of instructions such as those given in the *Electrical Review* "shock sheet" is compulsory but there is nothing like this for the home. How can people be told what they should do in such cases? Can more be done to prevent such accidents than by warning the public against the use of defective appliances, particularly in proximity to baths or sinks? Coroners at inquests on victims of electrical accidents might be asked to stress the necessity for prompt resuscitation measures, and record a verdict of death, not from electric shock, but from ignorance of the proper treatment.

* * *

Dealing with the career of a woman electrical engineer, the *News Chronicle* says that it is now her job "to test from the blue-prints straight from the designers' drawing boards the lifting power and stress ability of airplane under-carriages." There's obviously no waste of time in this establishment.

Industrial Lighting

High Wattage Translucent and Blended Fittings

By J. G. HOLMES, A.R.C.S., B.Sc., F.Inst.P., F.I.E.S.*

WARTIME experience showed quite definitely that, among other lighting improvements, the two developments discussed in this article had marked psychological effects leading to increased production and reduced absenteeism. The use of translucent reflectors which allowed a small proportion of upward light to illuminate the roof created a more lively appearance in factories which before this improved system seemed rather depressing in the absence of daylight; a proper combination of mercury discharge lamps and incandescent filament lamps produced a bluish-white blended light which was an acceptable alternative to daylight and could be used in factories where fluorescent lamps were impracticable.

The employment of translucent reflectors and blended light is becoming a well established industrial illumination practice. It represents a big change from the metal reflectors which were almost universally used in factories before the war. Some roof brightness helps to dispel "tunnel effect" gloom and in this way creates a livelier atmosphere

During the eight years since the lifting of the black-out restrictions the two principles of translucent reflectors and blended lighting have become well established. They represent a big change from the almost universal metal reflectors or covers associated with industrial fittings of the past which gave direct light only and created the so-called "tunnel effect" by making the ceiling and the walls above the level of the fittings relatively dark. There have been instances of inverted fittings being mounted on the roof trusses to provide a luminous background, to reduce the glare from the main fittings and to restore the sense of height and airiness which is lost when the roof space is apparently black. The liberal use of light interior colours has minimized the tunnel effect of opaque reflectors but, unless the floor of a factory is unobstructed and fairly clean and light, insufficient light will be reflected back to the roof for the best seeing conditions.

General diffusing fittings have been used in some factories but, although they give good results, they emit a considerable amount of light upward, apparently to no useful purpose. Even an impression of waste must be avoided and fittings from which 40 to 60 per cent of the light is emitted above the horizontal plane are generally ruled out on these grounds.

It follows that the best kind of distribution for most industrial applications is that defined as "semi-direct" in British Standard 398, emitting between 10 and 40 per cent of the total light output above the horizontal. This is a fairly wide range and it allows for different circumstances. For example, about 30 per cent upward light may be required if the roof has a high proportion of glass, which appears black at night; if it is of a complex structure, such as a Belfast truss, which may be a poor reflector; or if the roof is difficult to keep clean. Alternatively, 15 or 20 per cent upward light may be sufficient in a factory that has large clear areas which can be kept whitewashed and have a high reflection factor.

Working conditions are more natural if the roof is brighter than the floor, for severe mental stress may result from a pronounced

* Chief Technical Officer, Holophane, Ltd.

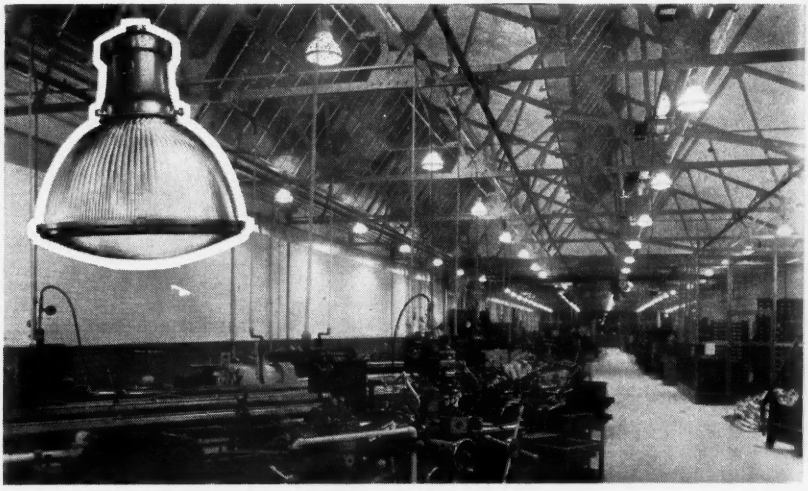


Fig. 1—Tecalemit machine shop with 300-W translucent fittings. Fig. 2 (inset)—One of the fittings

reversal of these conditions; as a general rule the photometric brightness of the roof or ceiling should not be less than one-tenth of the average photometric brightness of the visual task. It is usually sufficient if the illumination of the roof is not more than one-third of that of the working plane and a skilled designer has ample tolerance between these limits to find the optimum compromise for a given set of conditions.

The effect of the roof brightness in reducing glare from fittings is not easy to assess, largely because glare itself is so difficult to define. There is clear evidence that both disability glare and discomfort glare are caused as much by the intensity of the light from the fitting as by the luminance of the fitting in candelas/sq in, but the usual formulæ for glare take little account of the effect of the brightness of the immediate background relative to that of the illuminated area to which the eye has become adapted.

It would be quite uneconomic to illuminate the roof of a factory to such a level that the glare from an unscreened lamp became tolerable, and one of the secrets of the success of translucent fittings is that they provide a zone of fairly high brightness around the bright spot of the light source and so achieve the same kind of effect as a pearl lamp, on a much larger scale. Similarly, a white enamel reflector may reduce the glare from an unscreened lamp when seen full face, but may be glaring near the cut-off angle when the white enamel background subtends a much smaller angle at the observer's eye.

Although this article is mostly concerned with fittings for tungsten filament and discharge lamps, the same general considerations apply to fluorescent tubular lamps. Bare lamps can cause serious glare, although it may be mitigated by a large reflector; long lines of opaque reflectors without louvres can also cause serious glare if seen in hard contrast against a dark roof. A translucent diffusing plastic reflector is better in this respect than an opaque white one and many fittings are being made with apertures in the top of the reflector expressly for the purpose of affording upward light.

Translucent reflectors for low-wattage lamps are well known; the opal glass shade and the opal " Perspex " trough reflector have proved so successful that no other justification is needed for the adoption of a " translucent " reflector. Opal shades have not been much used for lamps of over 200 W and they suffer because the opal glass or " Perspex " is not able to exercise any significant directional control of either the reflected or the transmitted light.

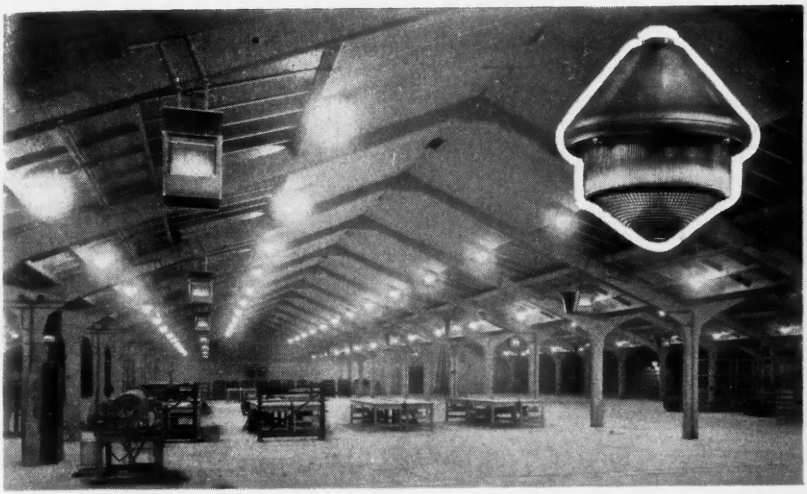


Fig. 3—Morgan Crucible Co.'s factory with translucent reflector-bowl fittings. Fig. 4 (inset)—One of the fittings

Prismatic glass reflectors have given very promising results. In the past, industrial fittings of this type have consisted of a glass reflector designed to give the required distribution of downward light and, following traditional practice for industrial fittings, an opaque metal cover over the reflector. The prisms on the glass are, however, never optically perfect. A small proportion of luminous flux is diffusely transmitted at the apex of each prism so that if the reflector is uncovered some upward light is available without affecting the distribution of downward light. The collection of dust on such a fitting must reduce the amount of light transmitted through the fitting in an upward direction and cleaning is necessary whatever the translucent material may be. It does not follow, however, that the collection of dust on the outer surface reduces the light reflected from the inside of the fitting; in general, dust is never worse than an opaque metal cover as used in the past.

The Tecalemit factory at Plymouth (Fig. 1) is lit by 300 W suspended translucent reflector fittings and, in spite of the considerable area of glass in the north-light roof, the useful light on the working plane from the translucent fittings is actually greater than when opaque metal covers were fitted. The proportion of upward light was about 25 per cent of the total light output, from fittings of the kind shown in Fig. 2.

The Morgan Crucible Co.'s factory at Neston (Fig. 3) is lit by 300 W translucent reflector fittings mounted directly on the roof. They were a special adaptation of the glass reflector-bowl pendant (Fig. 4) from which about 10 per cent of the total light output is emitted through the straight sides of the translucent glass bowl and serves to illuminate the roof surfaces.

The Enfield cable factory at Brynmawr is lit by 1,000 W translucent fittings of the type illustrated in Fig. 6 from which nearly 30 per cent of the total light output is in the upper hemisphere, making the whole factory seem light and airy after dark. The same type is used for lighting the enormous hangar at Filton for the Brabazon I aircraft, the relatively large proportion of upward light being of value in lighting the rather complex roof structure and the cat-walks. In this installation (Fig. 5) the fittings are used in groups of three, mounted in rectangular frames at the sides of the cat-walks, and total 2,300 W in each group.

This installation employs three-lamp fittings in each of which is one 1,500 W incandescent filament lamp between two 400 W mercury discharge lamps, which are

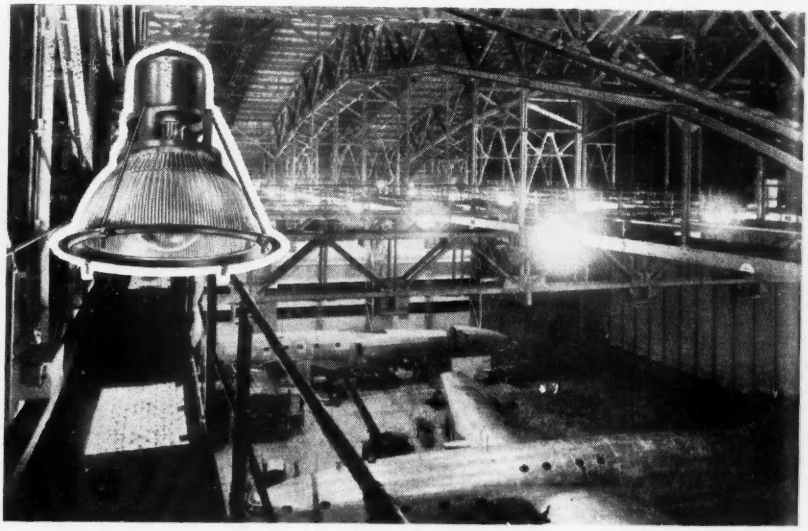


Fig. 5—Brabazon I aircraft under high-intensity translucent reflector fittings. Fig. 6 (inset)—High-intensity 1,000 W translucent reflector fitting

typical of another new trend in industrial lighting. The use of mixed mercury and filament light for factories has been known for over fifty years, but a number of difficulties have arisen from time to time and have retarded its development. The Brabazon installation has, however, proved so satisfactory that the same scheme has been widely adopted in industry and has been standardized for R.A.F. hangars, each of which has 28 pairs of translucent blended fittings suspended on a lowering cable for easy maintenance. Fig. 8 shows a typical fitting carrying one 1,000 W filament lamp and one 400 W mercury lamp and Fig. 7 shows an installation of twin fittings in the Steel Company of Wales factory at Margam.

The best method of obtaining the bluish-white light which is so effective in factories depends to no small extent on the mounting height of the fittings as well as on the illumination required. For low mounting heights, the tubular fluorescent lamp (up to 3,000 lumens) has proved itself; for medium mounting heights and for higher levels of illumination the MAT and MBT "blended" lamps which contain a filament and a mercury discharge column are very effective (up to 12,000 lumens); for high mounting and high illumination a combination of high-wattage filament lamps and high-wattage mercury lamps may be used, giving up to 60,000 lumens from each fitting. It may, perhaps, be noted that translucent reflectors have shown themselves very well suited to blended-light installations.

The use of "blended" lamps (types MAT and MBT) is quite straightforward from the point of view of the fitting design for medium-wattage installations. Care must be taken that the reflector, or diffuser, used in the fitting operates equally well for both the mercury and the filament components, but if this precaution is observed satisfactory results can be readily obtained.

These lamps have two principal advantages over the two-lamp method; first, they may be operated without any auxiliary gear and, secondly, they may be d.c. as well as a.c. operated. There is the difficulty that the lamps may go out if the voltage is reduced sharply and they may then take a period of about ten minutes to restrike.

It is general experience that the compactness of the 160 W to 250 W (MBT) lamps makes them more convenient to use than the 300 W and 500 W (MAT) lamps

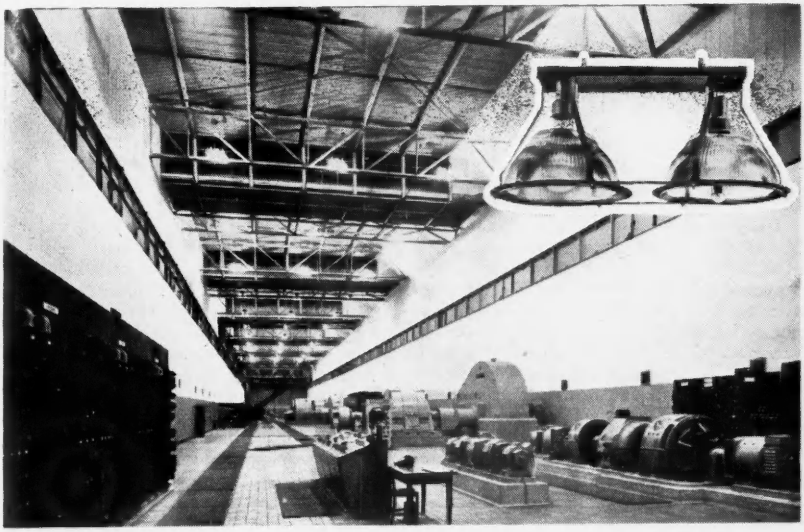


Fig. 7—Steel Company of Wales factory with twin blended translucent fittings. Fig. 8 (inset)—Translucent 500 W + 250 W fitting for blended lighting; filament left, mercury right

which need a very deep reflector for reasonably blending the light. The efficiency of these lamps compares favourably with that of general service lamps, representative figures being 15–17 lumens/W for the type MBT and 18–21 lumens/W for the type MAT, compared with 13–16 lumens/W for incandescent filament lamps. These efficiencies are, however, appreciably less than those of straight mercury lamps, type MB and MA, which are of the order of 30–36 lumens/W so it must be realized that the choice of the efficiency at which the blended lamps are operated has been made to secure the best compromise between the blending of reasonable proportions of filament and mercury and an adequate resistance ballast in the filament to stabilize the mercury discharge. It is not generally practicable, or economic, to use separate mercury lamps with filament lamps acting as the ballast.

The light from blended lamps is generally regarded as being rather rich in the mercury component at the expense of the filament component, the ratio of the fluxes being of the order of 3 : 1. In this respect some of the blended lighting installations, particularly those using the type MAT lamps in which the light from the discharge portion is controlled by the reflector much better than the light from the filament portion, have been criticized on the score that they are not much better in colour-rendering value than straight mercury. Many of these installations have, of course, been employed where it was desired to obtain the higher luminous efficiency and bluer colour of mercury light from a d.c. supply circuit.

For high mounting, high-wattage lamps must be used, thus requiring separate filament and mercury lamps with inductive ballast. The degree of blending is thus directly under the control of the lighting designer and he is able to obtain whatever balance between the mercury and the filament components is best suited to the requirements of the visual task in the particular factory. It is usually good practice to have roughly equal flux outputs from the mercury and filament lamps, which means that the nominal wattage of the mercury component should be about half that of the filament component. The ratio of flux outputs may, however, be varied between, say, 35 and 60 per cent mercury without losing the advantages of blended lighting. The accompanying table

indicates typical combinations, in terms of total flux from the lamps:—

Tungsten, watts	Mercury, watts	Mercury, lumens per cent	Overall effic. (average) lm/W
500	250	50	21
1,000	400	44	23
1,500	2×400	50	25

In addition to balancing the flux outputs from the two types of lamp, the distribution of light must be balanced so that the same degree of blending is obtained, for example, at a point midway between fittings as at a point immediately under a fitting. A variation of 10 or 15 per cent in the ratio may not be important, but a variation of 30 per cent may lead to the appearance of bluish or yellowish zones in the working plane. It is necessary for the lighting designer to control both the distribution of light from the fittings and the actual positions of the fittings in order to maintain a reasonably uniform degree of blending. The reflector for a high mounting must concentrate the light from both lamps if a high illumination is required, and this means directional control of the light.

As indicated above, it is often an advantage to use a translucent reflector such that the colour of the light emitted upward to the roof surfaces is uniform and is the same as that of the light reflected down on to the working plane.

One of the criticisms frequently levelled against a blended installation employing separate lamps is that coloured shadows may be cast by obstructions above the working plane. This is not necessarily a disadvantage, but prominent coloured shadows certainly look bad. They are due to the separation of the two kinds of light source and the resultant effect can only be serious when the edge of the obstruction is at an angle to a line joining the two lamps. This effect can be reduced by mounting the two lamps as closely as possible, or by using three or more lamps in a cluster. One quite successful method is to employ a high-wattage filament lamp with two mercury lamps, one on each side, which gives better results than having the three lamps arranged at corners of a triangle.

Some of the early experiments with blended lighting failed because the two types of lamp were put into alternate fittings, widely separated from each other; uniform distribution of flux and uniform blending may have resulted, but the coloured shadows were so severe as to be very distracting.

The use of blended lighting is not based entirely on the added luminous efficiency of the mercury lamps or on the improved colour rendering of the filament lamps. It has sometimes been said that the light from the latter seems rather "brown" and without sparkle while on the other hand it is felt that the light from mercury lamps is often too hard and causes serious colour distortion. Tubular fluorescent mercury lamps come between these two extremes and give satisfactory colour rendering, but types MAF and MBF have never been very popular under factory conditions because they do not seem to have achieved a satisfactory compromise.

The tubular fluorescent lamps are very good for low mounting heights, but they are unsuitable for high mounting because of the large dimensions of the reflector necessary for reasonable light control and because of the large number of relatively expensive fittings needed to provide the necessary total flux. A good blended lighting installation gives more blue light than an installation with tubular fluorescent lamps and, as the fittings are smaller and brighter, the results seem much more lively and there is a sparkle about objects on the working plane. The coloured shadows which are always present in some small degree seem to help this bright and cheerful appearance and to impart depth and contrast in the field of view even though the colours of the shadows themselves may be inconspicuous.

The economics of a translucent lighting installation seem fairly straightforward. The upward light is a sound investment in nearly all circumstances and its cost is small because the "downward" efficiency of a translucent reflector is usually nearly as high as that of an opaque reflector. The economics of blended lighting are more complex and it is difficult to generalize. The initial cost may be considerably more than that of an incandescent filament installation giving the same illumination while the saving in running cost may be partly offset by the maintenance charges. There is, however, a brilliant quality under an installation of translucent blended fittings which is lacking under fluorescent or filament lamps.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Council of the Gauge and Tool Makers' Association has re-elected **Mr. F. W. Halliwell**, M.I.Mech.E., M.I.Prod.E. (chairman and managing director, Gay's (Hampton), Ltd.), as president of the Association for the 1952-53 session. **Mr. A. L. Dennison**, M.I.Prod.E. (chairman, Birmingham Tool & Gauge Co., Ltd.), has been elected chairman.

Mr. J. Nicholson has been appointed manager of the Leeds branch of W. T. Henley's Telegraph Works Co., Ltd., in succession to the late Mr. L. Brooke. Mr. Nicholson joined the company's Sheffield branch in 1926 and was transferred to Leeds in 1931, being appointed an outside representative in 1939. He is on the Council of the N.W. Yorkshire Branch of the Association of Mining Electrical and Mechanical Engineers.

Mr. J. Nicholson

Mr. S. G. Wood, A.M.I.E.E., has been appointed engineer of the Coventry Sub-Area of the East Midlands Electricity Board. Mr. Wood joined the Coventry Corporation Electricity Department in 1930 and served in the installation, technical and substation departments before becoming assistant mains superintendent in 1949. Since 1950 he has been assistant sub-area engineer at Coventry.

Mr. A. E. Lanigan has taken up his new duties as district engineer at Jarrow-on-Tyne for the Wear Sub-Area of the North Eastern Electricity Board. Mr. Lanigan, who succeeds the late Mr. J. M. Nicholson, was first assistant district engineer at South Shields before taking up his new post.

Mr. Geoffrey Cole has joined the publicity department of Thorn Electrical Industries, Ltd., as chief assistant to Mr. S. T. Holmes, publicity manager.

Mr. K. A. G. M'Kibben, A.M.I.E.E., A.M.I.E.(Aus.), of Warrenpoint, Northern Ireland, has been appointed to a senior engineering position with the Australian Department of Supply. Mr. M'Kibben, who went to Australia in 1950, was formerly in the engineering department of the B.B.C. at Belfast. Earlier he had been employed by Harland & Wolff, Belfast, and the British Thomson-Houston Co., Ltd., Rugby.

Mr. S. B. W. Williams, B.Sc.(London), A.M.I.E.E., has joined Peirce & Williams, chartered civil engineers, as a partner with **Mr. G. R. Allen**, M.C., A.M.I.C.E., and the firm will now be styled Allen & Williams. Mr. Williams is the son of a former partner of Peirce & Williams, and after serving articles with and subsequently being assistant to Binnie Deacon & Gourley, joined the water engineer's staff in Singapore and became deputy water engineer there.

Mr. M. W. Humphrey Davies, M.Sc., A.M.I.E.E., lecturer at the Imperial College of Science and Technology, has been appointed to the University Readership in Electrical Engineering tenable at the Imperial College.

Mr. H. E. Humphries has been appointed managing director of Siemens Brothers & Co., Ltd., in succession to Mr. F. A. Lawson. **Sir H. W. Hugh Warren**, D.Sc., M.I.Mech.E., M.I.E.E. (managing director, Associated Electrical Industries, Ltd.), and **Mr. R. L. Basset**, have been appointed additional directors of Siemens Bros. & Co., Ltd.

Mr. H. E. Humphries

Mr. Andrew Hardie, chief inspector of the Halifax Public Lighting Department, has been promoted to the post of lighting superintendent.

At the first meeting of the London Lecture Session, 1952-53, of the **Association of Supervising Electrical Engineers** on the 21st October at the Lighting Service Bureau, at which Mr. C. T. Melling was inducted as the new president and gave his presidential address, the retiring president, Mr. T. G. N. Haldane, made a number of presentations. The silver cup of the Branch Merit Competition 1951-52 was presented to Mr. L. A. Sharp, hon. secretary of the South West London branch, for the best all-round record

of achievements for the 1951-52 session by his branch. Mr. D. H. Taylor, the winner of the W. E. Highfield Shield Competition, 1951-52, was presented with the shield, a miniature replica for his permanent possession and a prize of ten guineas for his paper " The Metadyne." Mr. C. A. Jones was presented with the second prize of five guineas for his paper on " Cold Cathode Lighting in the Modern Interior." The Thurston Trophy and prize of £10 in the Inventions Competition was presented to Mr. J. Flood for his invention of the Enfield grid suspension wiring system.

The executives of the fifteen branches and three manufacturing subsidiaries, forming the **Kerry's (Great Britain), Ltd.**, group, were entertained to dinner by the directors at Londonderry House, Park Lane, London, on 17th October, to celebrate the seventy-fifth anniversary of the foundation of the company by Alfred Kerry in 1877. The guests were received by Mr. E. P. Richardson, chairman, and Mrs. Richardson. The toast of " The Company " was proposed by Mr. W. C. Barker, the company's East Anglian representative, and manager of the Ipswich branch from 1934 until his retirement in 1950. The response was by the chairman.

The occasion was marked by the distribution of the company's seventy-fifth anniversary brochure to each guest. This brochure contains a brief history of the company and its subsidiaries. During the evening a silver salver was presented to Mr. Walter Hart, as a memento of his tenure of the office of managing director of the company, which he relinquished in December last. The spokesman on behalf of the executives was Mr. G. H. Brenchley, manager of the London branch.

Mr. A. E. Aird (left) receiving a presentation from Mr. P. Bregazzi on his retirement from No. 1 Sub-Area of the Merseyside and North Wales Electricity Board

A presentation in the form of a " Royal Worcester " dinner service from the staff of No. 1 Sub-Area of the Merseyside and North Wales Electricity Board, was made in the presence of a large gathering by Mr. P. Bregazzi, manager, to **Mr. A. E. Aird** on his retirement after forty-nine years' service, on 15th October. Mr. Aird started work in 1902 as an apprentice with the Liverpool Corporation Electric Supply Department, and in 1919 was appointed to the staff as installation superintendent, holding successive posts until as superintendent of works and substations he was responsible for all substation and outside installation work. He played a big part in the floodlighting and decoration of the City on

Kerry's (Great Britain) 75th anniversary dinner. *Left to right:* **Mrs. Cassleton Elliott and Mr. E. Cassleton Elliott (deputy chairman), Mrs. W. Hart and Mr. Walter Hart, Mrs. Richardson and Mr. E. P. Richardson (chairman), Mrs. W. N. Hart and Mr. W. Norman Hart (managing director), and Mrs. R. J. Lewis and Mr. R. J. Lewis**

the occasions of the royal jubilee (1936) and coronation (1938), and from 1938 onwards in the lighting and heating of 14,000 air raid shelters. His biggest job was in connection with the change-over of the city from d.c. to a.c. This work was commenced in 1926 and is now in its later stages. Following the presentation, Mr. Aird was entertained to dinner at the Bradford Hotel.

The **Liverpool Electric Cable Co., Ltd.,** held its prize distribution at St. John's Hall, Bootle, on 25th October. Approximately 150 employees and their friends attended. The prizes presented were in respect of various competitions held throughout the year, and included the W. J. Terry cup for bowls, the A. N. Smith cup for billiards, ladies' and gents' darts championships, and prizes for arts and crafts exhibits. Mr. J. T. Frost (works manager) made the presentations, and expressed the thanks of the employees to Miss McLean and her committee for organizing a pleasant evening.

Mr. C. E. Collins (chairman and managing director) presided at the annual dinner and dance of **Collins Electrical, Ltd.,** held at the Ardington Rooms, Clapham Junction, on Friday last. In proposing the toast to "Our Friends" Mr. A. J. Spendelow said that they had recently completed their 100,000th job and expressed the hope that they would be able to carry on the good work for many years to come. Mr. G. W. Bunn (British Thomson-Houston Co., Ltd.) responded.

Over 200 members of the staff and friends who were in attendance afterwards enjoyed an excellent cabaret, followed by dancing during which several spot prizes were awarded.

Mr. A. Gilbert, A.M.I.E.E., who is in charge of the London Electricity Board's polyphase meter test station at Bromley, has been appointed meter superintendent to the Singapore Corporation and is leaving England to take up his new post on 14th November. Before vesting date Mr. Gilbert was employed by the Beckenham Corporation and was previously with the Admiralty Compass Division, the Northampton Electric Light & Power Co., and Chamberlain & Hookham, Ltd. On behalf of the staff Mr. L. A. Gripper, sub-area engineer, recently presented him with an inscribed brief case and a cigarette lighter.

The Long Service Association of the **Metropolitan-Vickers Electrical Co., Ltd.,** held its annual social gathering in one of the staff canteens at the Trafford Park Works on 28th October. The qualifications for joining the L.S.A. are thirty years' service for men and twenty-seven years for women. The total membership is nearly 2,000 (including 172 women), all of whom are still serving with the company; in addition there are about 500 who have retired and are now honorary members of the Association. The president, Sir George E. Bailey, who is also chairman of the company, is himself in his forty-fifth year of service, having joined in December, 1907; seven of his colleagues on the board are members of the L.S.A., among them Dr. I. R. Cox (managing director) and Sir Arthur P. M. Fleming, who joined the company in May, 1900. At this year's gathering about 1,100 members sat down to dinner, including parties from L.S.A. branches in London, Sheffield and Motherwell. After dinner Sir George Bailey gave his presidential address, in which he spoke of the value of the Association and its beneficial influence in the company. He then

At the annual social gathering of the Metropolitan-Vickers Long Service Association: the president, Sir George E. Bailey, making a presentation to Mr. F. B. Holt, one of nine employees who have completed fifty years' service with the company

made presentations to nine members who had completed fifty years' service during recent months.

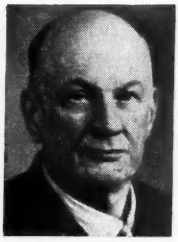
Following the presentations there was a concert by the Metropolitan-Vickers Male Voice Choir, which led the assembly in community singing.

The annual outing of staff and friends of **Rich & Pattison (B'ham), Ltd.,** was held on 28th October when a visit to the theatre was preceded by a meal at a city restaurant. The occasion was taken to make a presentation to the manager, Mr. S. E. Wilson, on the completion of twenty-five years' service with the company. In his speech congratulating Mr. Wilson, the managing director, Mr. H. P. Rich, briefly reviewed the growth of the company and announced that a branch would shortly be opened in Coventry. The company's secretary would shortly be leaving for the United States and Canada to develop further

the marketing of a patent product in these countries. A vote of thanks was passed to Mr. W. L. Rich for having organized the evening.

OBITUARY

Mr. J. F. Driver.—The death occurred on 28th October, at the age of seventy, of Mr. James F. Driver, D.L.C.(Hons.), M.I.E.E., M.I.Mech.E., who was well-known throughout the electrical industry for his association with Loughborough College, where he was head of the Department of Electrical Engineering for many years until his resignation in 1943. From that year until his death he was editor and a director of *Machinery Lloyd*.



The late Mr. J. F. Driver

Mr. Driver received his engineering training with the Brush Electrical Engineering Co., Ltd., with whom he later became head of the electrical department on the rolling stock side of the works. After a period with Rayworth's Traction & Patents, Ltd., he went to India to take up a position with the Bombay Electric Supply & Traction Co. On returning to this country he was appointed assistant to the chief instructor with Herbert Morris, Ltd., and from there joined the Loughborough Technical Institute (now Loughborough College), where he was in charge of all engineering and was responsible for equipping the laboratory and workshops. When the Engineering Department was divided into Mechanical, Electrical and Automobile Departments, Mr. Driver retained control of the Electrical Department and also all the works departments. He was responsible for the construction of the instructional power station in 1926 which supplies the whole of the electricity required for the college buildings and the high-voltage laboratory. Mr. Driver was a past chairman of the East Midland Sub-Centre of the Institution of Electrical Engineers, and hon. secretary of the Sub-Centre for many years.

Mr. K. S. Geipel.—The death occurred at Harrow, Middlesex, on 1st November at the age of sixty-one, of Mr. Kenneth S. Geipel, O.B.E.(Mil.), M.I.E.E., chairman and governing director of William Geipel, Ltd. Mr. Geipel was born at Blackheath, Kent, in 1891, and was educated at Tonbridge School and the City and Guilds Engineering College. He joined his father's firm (William Geipel, Ltd.) on leaving Tonbridge School and became supervisor in 1919, managing director in 1927 and chairman and governing director in 1937 on the death of his father. Mr. Geipel served in the Royal Engineers (Signals) from 1915 to 1919.

Mr. E. J. Doyle, sales manager of Controlled Heating Units (London), Ltd., and late of H. Fisher (Oldham), Ltd., died at his home on 25th October at the age of fifty-seven. He was previously for many years with Belling & Co., Ltd., and M. K. Electric, Ltd.

Mr. F. Croft.—The death occurred on 28th October, at the age of seventy-four, of Mr. Frank Croft, who, until his retirement in 1936, was chairman and joint managing director of Crofts (Engineers), Ltd. Mr. Croft was the eldest son of the late Mr. F. L. Croft, founder of the company, and had been associated with the concern during the whole of his working life.

Mr. J. C. Farebrother.—The death has occurred at the age of forty-nine of Mr. John Charles Farebrother, a director of Avon Electrical Services, Ltd., Stafford.

Mr. F. Ryder.—The death is reported of Mr. F. Ryder, chairman of the Lightfoot Refrigeration Co., Ltd.

WILLS

Mr. W. Shearer, chairman and managing director of Power Securities Corporation, Ltd., chairman of Balfour, Beatty & Co., etc., who died on 16th July, left £228,862 gross (£169,201 net).

Mr. K. A. Scott Moncrieff, M.I.E.E., Oxted, former chairman of the Cawnpore and Madras Electric Supply Corporations, the Hendon Electric Supply Co., and other companies, who died on 5th August, left £31,025 gross (£30,795 net).

Dr. F. W. Carter, M.I.E.E., for many years consulting engineer with the British Thomson-Houston Co., Ltd., and author of many technical works, particularly on railway electric traction, who died on 29th May last, left £11,418 gross (£11,345 net).

Mr. H. G. McHaffie, one of the original engineers with the British Thomson-Houston Co., Ltd., Rugby, when the company started to manufacture there and later chief electrical engineer for numerous Balfour Beatty projects in Scotland, who died on 4th July, left personal estate in England and Scotland valued at £8,707.

Mr. J. Sillavan, senior partner in the firm of Leigh & Sillavan, and a director of British Electrical Repairs, Ltd., etc., who died on 8th June, left £75,989 gross (£72,107 net).

Mr. J. H. Thomas, M.C., M.I.E.E., late managing director of A. C. Cossor, Ltd., who died on 4th July, left £14,268 gross (£11,635 net).

Ferrous Tube Making

ELECTRICAL engineering in the steel tube industry was described by Mr. H. E. Knight (chief electrical engineer, Stewarts & Lloyds, Ltd., Corby) in his inaugural address as chairman of the East Midland Centre of the I.E.E.

The main requirements (depending on type of process) were enumerated as follows: For the handling and preparation of raw materials, involving the use of conveyors, pinch rolls, shears, flash welders, pickling, cold rolling, etc., up to 600 kVA per mill. For hot and cold forming of strip and seam welding, from 50 to 7,000 kVA per mill. For handling raw tube, mainly by roller conveyors, rarely more than 60 kVA per mill, although change in direction of the tube travel might present limit-switch and " throw-off " problems at high speeds. For finishing, testing, inspection and despatch about 50 kVA/unit was required with special attention to limit switch systems and selective transfer devices. Special lighting facilities for both internal and external examination were needed, while time and sequence controlled immersion gear was used for pickling with a magnetic roll type drag out system to remove tubes from the spelter bath.

Welding Processes

The main welding processes employed for tube making were next explained. The continuous seam welding process needed some 300 h.p. of blower motors while other drives, including that of the welding mill, were by means of 5 : 1 or 3 : 1 variable speed d.c. 250 V motors totalling some 100 h.p. A 250 kVA flash welder was employed for joining consecutive rolls of strip for continuity of the process. The resistance welding methods were similar, the welder consisting of a 200/350 c/s water cooled transformer with a 30,000–40,000 A at 0–5·5 V output to an electrode " wheel," rotated by and in pressure contact with the tube positioned with its point of contact in incidence with the squeezing together of the longitudinal gap by side pinch rolls. The high frequency input was provided by a frequency changer, so avoiding the " weld stitching " which would occur at highest tube speed if a 50 c/s supply were used.

For making solid drawn tubing, a rotary forge piercer might require up to 3,000 h.p., while the Pilger mill could absorb 2,000–3,000 h.p., or some 7,000 kVA for a whole mill. The push bench forging extrusion process might require 3,000 kVA. The pushing mechanism, the moving parts of which might involve some 30 tons weight, required to be controlled with precision, so that a W.L. drive with a somewhat complex control system was most suitable.

A large three-process tube plant would consist of four continuous welding mills, two resistance welding mills, one plug mill and the usual services which would have a combined output of some 500,000 tons of tube a year, with a demand of 7,000 kVA and a weekly consumption of 650,000 kWh.

Power Supply

Electricity was delivered by the East Midlands Board at 33 kV by duplicate feeders to two 15 MVA at 35/11 kV transformers through the usual switchgear. The 11 kV switchgear was of the duplicate busbar type sectionalized and arranged for serving the tube works 11 kV ring main. Some 3,000 kVA was available through 11/3·3 kV transformers in each of four substations feeding out through radial feeders to groups of medium size drives. General works drives, flashwelders, etc., accounted for some 2,000 kVA at 415 V, three-wire only, from each substation.

Lighting and miscellaneous heating was controlled by four-wire breakers on the 415 V boards under each substation, each department thereafter having a separate four-wire 415/420 V feeder which ensured that lighting and heating were divorced from the l.v. power system. In addition, there was a 110 V supply for hand lamps, portable tools, etc., on a departmental basis. M.g. sets and rectifiers provided some 500 kV of d.c. for variable speed drives.

The works earthing system was described, since it involved a considerable number of trials because of changes in the geophysical properties of the soil resulting from disturbance of the soil strata during levelling, etc. Power factor correction was effected by synchronous motors on selected drives on the 11 and 3·3 kV systems, whereas on the 415 V system it was arranged on a departmental basis by static condensers.

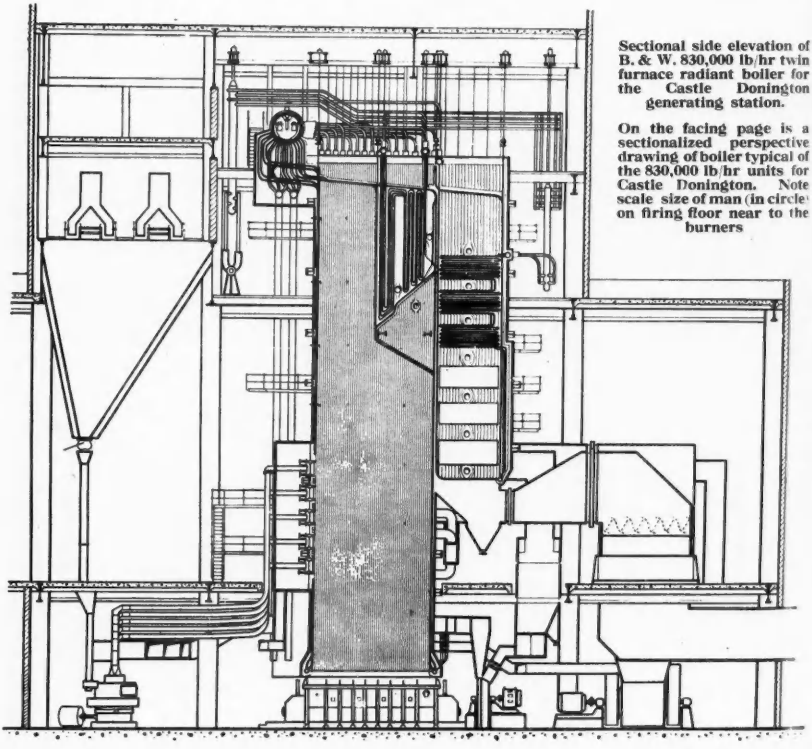
100 MW Unit Boilers

Largest So Far Designed in this Country

CASTLE DONINGTON, the B.E.A. East Midlands Division's new station on the banks of the Trent, breaks new ground in that it will be the first British power station to be arranged for single-boiler operation of 100 MW generating sets. Each of the Babcock & Wilcox boilers is designed for an evaporative capacity of 830,000 lb/hr—50 per cent greater than that of any boiler so far built in Great Britain—with steaming conditions of 1,600 lb/sq in and 1,060 deg F to allow for 1,500 lb/sq in and 1,050 deg F at the turbine.

Of the fully radiant type, without any convection surface, each boiler will stand 120ft from ash basement to drum centre (144ft overall) with a width of 85ft and a depth of 75ft between front and rear stanchions, or a total of 152ft overall including the pulverizing mills and air heater bays.

Although of well-established design, these boilers, by reason of their size, the high steam temperature and the type of coal to be burned, have one or two noteworthy features. The comparatively low ash-melting temperatures of British coals influenced the choice of a twin-furnace

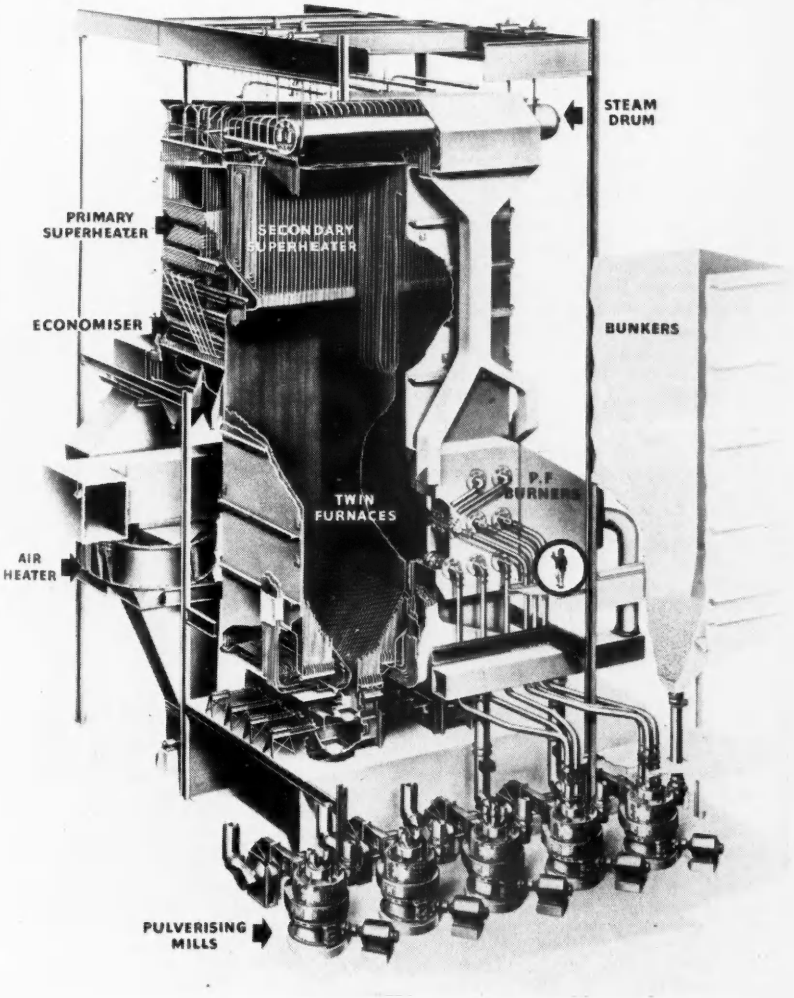


Sectional side elevation of B. & W. 830,000 lb/hr twin furnace radiant boiler for the Castle Donington generating station.

On the facing page is a sectionalized perspective drawing of boiler typical of the 830,000 lb/hr units for Castle Donington. Note scale size of man (in circle) on firing floor near to the burners

design, the additional tube screen between the furnaces giving better control of furnace temperatures and preventing any possibility of a " hot core " in the centre of a furnace which, without the screen, would be nearly 80ft wide.

There is an element of novelty in the arrangement of the pulverized fuel burners, of which there will be 20 per boiler, arranged in five tiers of four burners, each tier being supplied by a Babcock " E " mill of a capacity of 15 tons/hr. Under normal working, four mills will operate at m.c.r. and three at 80 per cent load. Coarse control of steam temperature control will be obtainable by utilizing combinations of various tiers of burners, while fine control within close limits will be maintained by



spray type attemperators situated between primary and secondary superheater stages. The primary superheater is to be of the horizontal loop type, while the secondary superheater will be of the pendant type, situated behind a slag screen near the top of the combustion chamber. An economizer of the continuous loop tubular pattern is to be incorporated and the drum is to be fitted with steam separator units of the Babcock " Cyclone " type.

It is believed that the main pre-heaters, of the Howden-Ljungstrom regenerative type and designed to give an air temperature of about 400 deg F, will be the largest ever built in this country. There are to be two of these per boiler. There is, in addition, to be a small recuperative air heater of cast iron construction for the primary air, through which gases from a hot zone of the furnace can be by-passed as necessary. For very wet coal, the primary air temperature can, by this means, be boosted up as required to maintain the desired temperature (around 160 deg F) of the coal and air mixture passing through the mills.

This auxiliary heater avoids the necessity of a much larger main air heater which, in addition to increasing the capital cost, would have given an unnecessarily high primary air temperature with dry coals and necessitated the use of large quantities of cold tempering air, with consequent loss of efficiency.

It is anticipated that the first boiler will steam in 1955. Some idea of their size is conveyed by the fact that the overall height is only some 25ft less than that of Nelson's column, while the floor area would accommodate a couple of good sized surburban houses and gardens. The leading dimensions are:—Height, ash basement to drum centre 120ft and overall 144ft. Unit centres 80ft. Depth from front to back: boilers 75ft, mills and bunkers 35ft and air heaters and fans 42ft, a total of 152ft. Total length of tubes approx. 41·5 miles. Drum: length 50ft, thickness 5¼in and internal dia. 5ft 6in. Weight to be lifted 120 tons. Air heater surface 110,000 sq ft each (two per boiler). Approximate diameter of rotor 21ft 6in.

Faraday House Dinner

THERE was a large gathering of members of Faraday House Old Students' Association and a number of distinguished guests at the Savoy Hotel on 30th October for the annual dinner under the chairmanship of Mr. D. E. Bird, president of the Association. Col. B. H. Leeson, president of the I.E.E., the principal guest, said he was unable to propose the toast of " Faraday House " without extending it to Old Faradians for there was no doubt that it was they who proved the worth of their system of education.

After some fifty years of development the electrical industry found itself divided into supply, which was nationalized, and manufacturing, which was not; but there was a bond between its men, the kind of personal bond fostered within the I.E.E., which brought them all into line.

Dr. W. R. C. Coode-Adams (Principal), in responding, remarked that 120 years after Faraday produced the first toy electric motor, we were told that a Technological University was needed, but so far nothing had come of it. His idea of a technological college was that it should teach students to think logically and clearly, thereby enabling them more easily to acquire technical knowledge. In welcoming Dame Caroline Haslett, the Principal drew her attention to the presence that evening of the first two women students of Faraday House.

Mr. J. C. Thompson, past-president F.H.O.S.A., proposed the toast of " The Guests " (nearly 200) and thanked Col. Leeson for enabling them to maintain their tradition that the toast of Faraday House should be proposed by the elected head of the profession.

General Sir Ouvry L. Roberts, Quartermaster-General, in replying, emphasized the Army's need of electrical engineers. Anyone who took up an Army commission would gain experience in a wide variety of subjects which he would never forget.

Mr. H. Ewbank, chairman, Ewbank & Partners, consulting engineers, proposed the toast of the chairman, who, he said, was one of the select band of Faraday House gold medallists.

Mr. D. E. Bird, in response, mentioned that evening's record gathering and his belief that the dinner was a valuable means of helping to further the aims and objects of the Association. He asked old students living in and around London to offer accommodation to enable more students to attend the annual dinner. He mentioned also that a branch of the F.H.O.S.A. had been formed in Pakistan and that as it was holding its first dinner at the same time as theirs, a greeting cablegram had been sent.

Engineering in Europe

Survey of Current Literature

CONSIDERATION of the various methods of testing h.v. insulators indicates that the greatest care needs to be exercised when applying mechanical tests, especially tensile tests, because tears may develop much later through testing with excessive loads. The dangers of purely electrical tests are comparatively much smaller, but tests at alternating temperatures are nothing like a truthful representation of the most severe thermal stresses that actually occur in service conditions; they are round about one order of magnitude too high. Capacitance measurements and measurements of the dielectric loss angle may indicate gross structural irregularities, comparatively large cavities, etc., but are not reliable under all conditions. What most of the methods used so far fail to reveal with absolute certainty is porosity. This remark applies even to the otherwise useful h.f. testing methods, except for those working with current oscillograms taken with carefully filtered frequencies. The only absolutely satisfactory method of testing for porosity and irregular structure is the ultrasonic method, which is essentially an echo-sounding method. The article outlines this method and illustrates it with very revealing oscillograms taken on faulty insulators.—" Non-Destructive Testing of Insulators," G. Reverey, *Elektrotech. Zeitschr.* (A), Vol. 73, No. 14, pp. 451–455, 11th July, 1952, in German.

Inductive Interference

The direct earthing of power transmission lines changes the conditions of their interference with neighbouring communication lines so that the effects have to be recalculated and results confirmed by measurements. A particular case is reported in which the test conditions faithfully corresponded to those obtaining during an earth fault in a directly earthed system where the short-circuit current returns to the substation through the transformer star-point. The tests showed that generally the actual dangers from induction effects are less severe than would be expected from theoretical results if a railway track is near the station. This, however, applies only to single-phase faults in a directly earthed system, but not to two-phase faults in a compensated system because in the latter case there is no knowing where the return path of the current will lie if the fault occurs at a great distance from the railway track. There is no sound reason for attributing a general validity to these results because they might be materially influenced by the local conditions on the test site, yet they provide a useful indication of general trends in these phenomena and show how necessary it is to make tests before installing costly protection against dangers which, though by no means imaginary, might easily be overestimated.—" Measurements on Inductive Interference Effects on Railway Communication Lines by Three-Phase Transmission Lines," R. Buckel, W. Neumann, and H. Riedel, *Elektrotech. Zeitschr.* (A), Vol. 73, No. 15, pp. 477–479, 1st August, 1952, in German.

Surge Arrestors

The effect of rain and dirt on the breakdown voltage of surge arrestors consists in either a temporary increase or reduction of the breakdown voltage, of which the first reduces the protective effect of the divertor while the second may make it fail to extinguish the follow-up current of commercial frequency. The nature of this undesirable effect of rain and dirt depends very much on the type of divertor used. The two main modern types are distinguished by a different mutual arrangement of switch-gap and quench-gap assemblies and earthing resistances, respectively. In one of the main types, switch gap, quenching gap and earthing resistances are kept separate while in the second main type switch gap and quenching gap are combined to form a multiple gap. In a sub-group of the latter type switch gaps

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

and quenching-gaps alternate, producing the so-called "sandwich" arrangement. The last of the three arrangements is the most favourable with regard to alterations of the divertor characteristics under the influence of rain and dirt.

Comprehensive tests in the works of Sprecher & Schuh, the prominent Swiss producers of divertors, have shown that the dangers of the variations of the characteristics by rain and dirt deposits may be considerably reduced by improving the voltage-control system of the divertor, particularly by using RC control in preference to purely capacitive control. Details of the tests and the most favourable voltage control circuits as well as representative divertor characteristics are presented.—"Effect of Rain and Dirt on the Breakdown Voltage of Modern Surge Arrestors," J. Amsler and L. Regen, *A.S.E. Bull.*, Vol. 43, pp. 311–316, 19th April, 1952, in German.

Corona Losses

An installation for observing and measuring corona phenomena in artificially produced climatic conditions is described and illustrated by many informative photographs, diagrams and graphs of measuring results. The plant is designed for alternating voltages up to 300 kV and comprises a cylindrical container of 14 m length and 3 m diameter which encloses the conductor under test. The results of measurements on a single conductor are transferable to the case of three-phase conductors by the use of Potthoff's conversion rule, according to which the specific losses of a conductor, once mounted in the vessel and then used as a phase conductor in a three-phase line, are equal if the field on its surface, or its surface charge, is equal in both cases. This equality may be established by measuring the charging current or by calculation, considering the product of voltage and service capacitance. The latter may be exactly calculated, and the voltages producing equal losses on the conductor in the container and on the same conductor in a three-phase system will then be in the inverse ratio of the capacitances of the conductor in both cases. The installation described permits of a wide variation of the climatic conditions, thus of temperature, pressure and moisture variations, and of producing precipitations (rain and sleet), winds, fog and icing on the conductor, most of the artificial conditions being maintainable for any desired period by automatic controls.—"Installation for Testing and Measuring Corona Losses on Very High Voltage Conductors in Artificial or Natural Climatic Conditions," E. Seylaz and K. Berger, *A.S.E. Bulletin*, Vol. 43, No. 14, pp. 593–601, 12th July, 1952, in French.

Unusual Current Transformer

This paper is devoted to the particular kind of current transformers pre-magnetized at the triple operating frequency, first developed in the U.S.A. by Boyajian and Camilli and known as "orthomagnetic bushing current transformers." The great advantage of these transformers is that the superposition of 180 c/s voltage on the normal 60 c/s operating voltage leads to an almost complete suppression of the current components of the latter frequency due to hysteresis losses and to the saturation of the iron. Only the component corresponding to the eddy current losses, which is mostly negligible, remains. The total iron losses, which are slightly increased, are entirely covered by the source of the triple frequency. Very favourable is the increased permeability for the 60 c/s magnetization which also results in a linearization of the magnetization curve at 60 c/s. The author's own suggestion is a circuit by which the pre-magnetization at the triple frequency may be performed by the transformer itself instead of by the rather complicated apparatus for extraneous pre-magnetization otherwise required. The author's circuit is shown and described for the usual set of three current transformers for three-phase operation.—"The New Type of Current Transformer Pre-magnetized at a Higher Frequency," I. Goldstein, *A.S.E. Bull.*, Vol. 43, pp. 316–319, 19th April, 1952, in German.

New Swedish Stations

FOUR new hydro-electric power stations are to be built on the Ume river in North Sweden, reports the Swedish State Power Board. Three of them, with a total capacity of 195,000 kW and an annual output of 979 million kWh, will be situated on a 20-mile stretch beneath the outlet of Lake Storuman into the river. The location of the fourth plant has not yet been definitely decided upon. A private company has applied for approval of a ten-year project to build a 105,000 kW station on the Harrsele rapids on the Ume river.

Sydney Reorganization

Severance of Generation from Distribution

At the end of 1951 the functions of generation authority discharged for 47 years by the Sydney County Council and its predecessors passed to the newly constituted Electricity Commission of New South Wales. The Council's report for that year, received from the general manager, Mr. C. J. Craggs, is therefore the last to deal with this aspect of electricity supply and the opportunity is taken to review the history of the undertaking.

Appropriately enough, the Council's newest station bears the name of the first, opened on 8th July, 1904—Pyrmont. The original installation on the Darling Harbour front comprised two generators with coal-fired steam-raising plant of a total capacity of 900 kW. In the new station one 50,000 kW set was nearly ready for commissioning at the end of last year, with another to follow this year. The Council's second station, Bunnerong, on the shores of Botany Bay, came into commercial operation in 1929. Hopes were entertained of making it a pit-head station. A coal seam was discovered at the considerable depth of 4,000ft, but on analysis the fuel proved to be worthless.

Plant Construction Problems

The report tells of the many difficulties encountered since the war. After persistent efforts to expedite delivery of generating equipment from Great Britain, the Council was confronted with the paradoxical position that the plant came forward at a greater rate than it could be erected because of the lag in building and civil engineering work on the site. In these post-war years prolonged disputes also arose over the introduction of shift work for maintenance crews at power stations and two major strikes occurred lasting in all 55 days.

In 1951 the peak demand on the Council's power stations and those of the interconnected systems was again in excess of the capacity available. Load shedding became so frequent that the State Government had to institute a form of rationing by prohibiting the use of electricity at specified hours on normal working days in each of five zones in rotation. It was expected that industries would make good the loss of production by operating at night or week-ends, but few of them did so and there was a falling-off in industrial electricity sales. A good many firms installed their own generating plant and arrangements were made for the purchase by the Council of their surplus power which in the aggregate amounted to 18,000 kW at times of peak load.

Large Deficit

Sales of electricity in the county district and to the Council's bulk supply customers in 1951 totalled 1,330 million kWh, an increase of 2·1 per cent. Because of the continuing rise in basic wages and the cost of fuel, a general increase in tariffs was brought into force on 1st March, 1951, and a further revision, affecting industrial and commercial consumers only, was introduced six months later, so that the average price of electricity advanced during the year by more than 25 per cent (from 1·574d to 1·979d/kWh sold). Even so, gross income fell short of expenditure by no less than £1,138,389. Revenue rose by £2,464,681 to £11,055,574, and working expenditure by £2,903,413 to £10,053,195, leaving a gross profit of £1,002,379 before meeting fixed costs of £2,140,768. The average price of coal advanced during the year from £3 0s 4d to £4 4s 5d a ton and of fuel oil from £9 16s 10d to £12 1s 11d a ton.

Of the Council's 6,137 employees 2,203 were transferred to the Electricity Commission at the end of the year.

Prefocus Lamp Caps

THE revised edition of B.S. 1164, which specifies the dimensions of prefocus lamp caps and holders for not more than 250 V, now includes details of the British and small prefocus caps P.22/21 and P.15/19, covering also recommended gauges for caps and holders and including drawings of the caps and holders mentioned. Copies are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 3s post free.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Gas v. Electric Cooking

I AM delighted that Mr. James (*Electrical Review*, 17th October) has attacked the design of the modern electric cooker, and asks for more variety in size and efficiency of operation.

As he says, the hob of the modern electric cooker is far too small for most housewives. They frequently find that, although one hotplate would keep all pans cooking, they have to use two plates simply because of lack of space. Added to this, certain cookers have their hotplates situated so far back on the hob that there is no clearance when a pan of more than 8in diameter is put on to boil.

The loading and size of boiling plates needs improvement. A stewpan with an 8in diameter base has a capacity of 7 pints which means that such vegetables as cauliflower, marrow and spinach will, for a family of more than four, need a much larger stewpan, and one which will overlap the hotplate. If the hotplate is not absolutely level, then time and electricity are wasted. It would be good to see one really large boiling plate to keep several pans boiling or simmering as the case may be, and one 7in or 8in plate for the single saucepan. Each plate, whether solid, semi-radiant or radiant, should have a high loading and a flexible heat control which would range from quick boiling to *real* simmering (an almost imperceptible movement under the surface of the liquid) in the shortest space of time.

By all means alter the grill boiler and give the consumer a larger grilling area. The 10in by 8in grill boiler cannot cope with a good Dover sole or plaice without de-tailing as well as beheading it. Again, toast, two or three slices at a time with room to spare is wasteful.

Oven size and control have altered considerably, but I do not agree with Mr. James that the oven should be shallow and wide to make removal of food easier. The opening of the door would allow too much heat to escape and, in consequence, oven elements would have to be boosted to make good heat losses. In a full oven this might give rise to uneven cooking. We need larger ovens so that we can cook more economically.

Thermostats have, let us hope, come to stay—they are easily set, give visible warning, good control of temperature, and are a boon when there is a drop in voltage. By all means provide manual control for anyone who insists on it, as well as top and bottom heating.

The light mottled oven interior should certainly be re-introduced. Not only does it make the need for cleaning more obvious, but also makes the oven itself look larger. It is much easier to take the oven interior over to the sink and clean it in good light and at working height than to go on hands and knees, with one's back to the light, and clean it on the spot.

Other improvements which I suggest are:—1. Differing length of legs, so that the 5ft woman has not to stand on tip-toe, and the 6ft woman has not to break her back when stirring a pan. 2. Greater ease of cleaning, especially for the warming cupboard, where some parts can still only be reached with a dishcloth on a skewer. 3. A cooker which *sounds* good. Many cookers to-day *look* good, but when the oven or warming cupboard door is opened feel fragile and sound unmistakably tinny.

KAY WILSON,
Hon. Sec., Association of Electrical Housecraft Advisers.

Wembley.

MR. JAMES' article (*Electrical Review*, 17th October), which is intended to help the electrical army win its war against gas, in the domestic sphere, still misses the vital point in spite of recognizing that "the housewife has thrown down the gauntlet, etc. . . ." The fact is that the "housewife" (why not the "domestic user"?—many men are equally concerned) is forced to accept the best of two mediocre choices and consequently, in the main, uses gas.

From a practical point of view the combination of a gas/electric cooker is the ideal answer. The domestic user has never (except perhaps in a minute number of cases) had the opportunity of experiencing the benefits of such a combined cooker. The war will continue unabated until such joining of forces is achieved and gas will continue to lead.

In daily use the oven gets the least work, the grill comes next in order and the boiling rings are used most and, for the reasons given later, the best combined stove would be one having an electric oven, an electric grill, together with three gas boiling rings. No electric kettle is required. Gas boiling rings with their efficient range of control between maximum and minimum heat on *every* ring (with no extra cost) are a boon in many cooking operations. Gas rings do not need expensive special utensils and the heating of small quantities of liquid is much quicker and more economical.

Round pans on the typical rectangular plates of an electric stove are unpractical and wasteful of heat, and there is a large waste of energy caused by the heating up of large metal masses, including the heavy gauge metal ware which is necessary. Circular elements seem to be the exception. Even then, when used at low heat for small vessels, the outer edge of the plate wastes heat by absorption and radiation.

In many electric kettles (which are considered essential with electric cookers) more water than is needed has to be boiled.

Casserole cooking in glassware or pottery cannot satisfactorily be undertaken on an electric boiling element, but is simple on a gas ring. There is no comparison in length of life and maintenance costs between gas and electric boiling rings or plates. The gas ring "goes on for ever."

An electric oven, on the other hand, is more satisfactory than gas, provided it has a really wide range of heat control. Distribution of top and bottom heat is more readily obtained and maintained. Conservation of heat is better and the physical difficulty of lighting a gas oven is absent. Gas will blow out when doors are opened and the oven is at low heat. Generally speaking an electric oven is cleaner and, of course, fume free.

The electric grill is also superior to the gas grill, mainly on account of much more even heat distribution over a larger area, and the *area* heated can readily be maintained constant at any spot temperature. It also has the advantage of reaching maximum temperature much more quickly.

Any comparative tests of the points mentioned should be made with stoves and cooking utensils which have had at least eighteen months' normal domestic use. An equally high efficiency may be possible in all directions with "new and shiny" equipment, but this same efficiency will certainly not be maintained during the long life which the domestic user expects to get from this equipment.

The next points diverge from the main issue, but are mentioned as being of general application to gas, electric, or combined stoves.

All models should have choice of oven door opening from left or right, or even bottom hinged to form a useful shelf when opened. A competitive model should be readily available which has its oven raised sufficiently from the floor to avoid stooping or getting on to hands and knees. The boiling plates, grill, etc., would then be alongside the oven with the space beneath utilized for shelves to carry pots and pans. Floor space considerations govern demand for such a unit, of course, but it is believed that a big demand nevertheless exists.

It is hoped that this letter will make a small contribution towards peace in this particular direction between two efficient and essential industries.

PEACEMAKER.

WHEN the article by Mr. W. J. L. James appeared I seized my pen with every intention of writing to ask where in the world the author had obtained the misinformation upon which he based his remarks; and why you had published copy so racy and well suited to the lay Press but so misplaced in a technical journal.

In anticipation that others would raise these questions I relaxed, but now I find your contributor "Reflector" following the same line. Surely *he* should know better than to write lightly of gas being equalled in speed by "heavily loaded boiling plates"—or does he really believe a 3,000 W plate, as demanded by Mr. James to be practicable?

Please let us have something authoritative on the subject and thus bring things into focus. S. F. BICKELL, M.I.E.E.

Frampton Cotterell, nr. Bristol.

LIGHTING IN LIVERPOOL

Committee's Annual Inspection

AT Liverpool experiments are being made with a cold cathode lantern for street lighting. During the annual inspection by Ald. A. Critchley (chairman) and members of the Street Lighting Committee on 31st October the prototype of a lantern which may be used to illuminate Liverpool's redeveloped waterfront—the pier head—was seen. With five U-shaped 8ft 6in tubes sealed with a reeded " Perspex " shade, the lantern has a lumen output of 12,000 and an estimated life of 13,000 to 15,000 hours or nearly four years. Mr. C. C. Smith, Liverpool's lighting engineer, said that with the high winds which sweep in from the river they were looking for a lantern without hinges or doors. When a tube burnt out, the whole lantern would be taken to workshops and replaced by another. It was the first time cold cathode lamps had been used for street lighting. To combat climatic conditions, rust and corrosion, metal fittings were of aluminium.

The committee saw Park Road, one of the main trunk roads radiating from the city, where a scheme for replacing filament type lamps with 140 W sodium cut-off lanterns is in progress. Liverpool is one of the leading users of sodium lighting, more than 62 miles of roadway being so lighted with 3,317 lamps. At Speke, 100ft wide dual track roads are illuminated with centrally-placed sodium lanterns. To illuminate the sky-line of three-storey flats in the centre of the township, " Perspex " ends have been fitted to the lanterns.

In side streets too, Liverpool claims a lead. Where there are no front gardens " Critchley " wall lanterns are replacing gas lamps and eliminate the need for standards on narrow pavements. Already 600 of these light 9½ miles of streets. With a cast backplate, two 60 W lamps, vitreous enamel reflector and opalized " Perspex " outer cover, the lantern costs about £7 10s.

Speaking at a dinner which followed the inspection, Ald. Critchley said there were 21,285 electric lamps in Liverpool compared with 20,496 at 31st March this year and 17,989 pre-war. They had on many occasions spoken of the need for large-scale conversion schemes from gas to electricity. After referring to the Ridley Committee report on national policy for the use of fuel and power resources, Ald. Critchley said: " A factor which does not assist us in this matter of conversion is the new charge for electricity service lines to public lamps. With the present suggested charges, the conversion of Liverpool's gas lamps to electricity would cost well over £100,000 for service lines alone. That is a very serious matter."

Looking ahead, the Department would be called upon to play an important part in the many special events planned to take place in Liverpool next year. First were the Coronation celebrations in June, followed by the British Association meeting in September, and the annual conference of the Association of Public Lighting Engineers in the same month, when their own lighting engineer, Mr. Smith, would be honoured as president.

During the dinner, the Lord Mayor of Liverpool (Ald. A. Morrow) presented the certificate of meritorious service to Mr. F. Wainman, retiring that day after forty-nine years' service as principal administrative assistant in the Street Lighting Department. On behalf of the Committee Ald. Critchley presented a silver cigar and cigarette box. Earlier in the day, colleagues at the Department's headquarters had presented him with a standard lamp and a chest of wood tools.

Street lighting at Woodend Avenue, Hunts Cross, Liverpool. The 140 W sodium lamps in Liverpool cut-off lanterns are mounted at 26ft on concrete standards with an average spacing of 35ft

Commerce and Industry

Export of Copper Goods

Canadian Aluminium for the U.S.A.

THE export of some copper goods to any destination other than China, Hong Kong or Tibet under open general licence is now permitted if the value of the goods exceeds the value of the copper or copper alloy content, calculated at the rate of £430 per ton for copper and £350 per ton for alloys mainly of copper. This licence applies to goods specified in Group 6(2) of the First Schedule to the Export of Goods (Control) (Consolidation) Order, 1952. Under a similar previous licence, which is revoked, the values were £500 per ton for copper, £420 per ton for alloys mainly of copper, and £400 per ton for copper cable and wires. The reductions in the minimum values have been made in order to facilitate the export of certain ranges of copper and copper alloy manufactures. Inquiries regarding the open general licence referred to should be made to the Export Licensing Branch, Board of Trade, Atlantic House, Holborn Viaduct, E.C.1 (telephone: City 5733). Copies of the open general licence can be obtained from H.M. Stationery Office.

Engineering Wages Claim

Representatives of the engineering trade unions met in London on 29th October to consider the employers' offer of an increase of 7s 4d a week in the wages of adult male operatives. Upon the initiative of the Amalgamated Engineering Union the conference decided to reject the offer as inadequate and to seek further discussions with the employers in an endeavour to persuade them to agree to a larger increase. A proposal that the ban on overtime and piecework should now be imposed, put forward by the Foundry Workers and the E.T.U., was not accepted. Amendments proposing the acceptance of the offer and a ballot of the unions' membership were defeated.

Union representatives were to meet the engineering employers yesterday (Thursday).

Aluminium "Lent" to America

During the next few months the United States is to receive from the Aluminum Co. of Canada 20,000 metric tons of aluminium originally destined for this country. In announcing this transaction the Ministry of Materials says that the United States Government has agreed to replace this aluminium and the 45,000 tons previously "lent" between the latter part of 1953 and 1955. British stocks will be sufficient to meet manufacturers' needs without being completely exhausted. British options on the Canadian company's production are being extended by 25,000 tons a year from 1957 to 1960.

Children's Cooking Competition

Before an audience of over 3,000 in Glasgow's Kelvin Hall, recently, the South West Scotland Electricity Board held the final of a children's cooking competition which has been running in the Board's area for the past three months. On the stage the five boys and five girls—finalists of over 1,200 entrants—had to grill a kipper, make drop scones and prepare a cup of tea. An electric cooker, electric kettle and a preparation table were provided for each competitor. On the electric cookers the children were required to use one plate only—the grill boiler—in cooking the scones and kipper. The judges were Mr. Philip Harben, Miss Isobel Gibson, Principal of the Glasgow and West of Scotland College of Domestic Science, and Mr. Roger Dutron, Principal of the Scottish Hotel School, Glasgow. Mr. Harben presented each of the finalists with a copy of his new book "The Young Cook."

Engineering Industry Entrants

It is shown in the October *Ministry of Labour Gazette* that during 1951 a total of 35,471 boys of 15–17 entered the engineering, shipbuilding and electrical goods industries; of these 21,487 were apprenticed to skilled crafts or were preparing for recognized professional qualifications. The number of girls of 15–17 entering these industries was 12,561 of whom 371 were apprenticed to skilled crafts, etc.

At the end of 1951 the number of male workers in this group was 1,479,400; there were 418,300 female workers.

E.C.A. Leicester Dinner

Mr. R. J. Halliwell, national vice-president of the Electrical Contractors' Association, suggested at the recent annual dinner of the Leicester Branch that night use of electricity should be encouraged to keep the cost of electricity at a reasonable level. He suggested that the B.E.A. should arrange the introduction

of night tariffs, manufacturers the necessary suitable devices for night operation, and that contractors should persuade clients to take advantage of the new tariff.

Mr. Halliwell said that of 846,000 workers employed in the electrical industry the supply and contracting sections absorbed 246,000, almost one-third of the total number. The Lord Mayor of Leicester (Ald. Geoffrey Barnett), in a tribute to the Association, said they appreciated what the Association had done for the electrical industry. Mr. R. C. Spencer (chairman of the Branch) presided, and Mr. H. S. Wathes (chairman of the Electrical Retailers' National Committee) and Mr. J. Mould (deputy chairman, East Midlands Electricity Board) also spoke.

Norwegian Ambassador's Visit to B.T.H. Works

Before attending the annual gathering on 24th October of the B.T.H. Overseas Association, at which he was the principal guest, Mr. Per Preben Prebensen, the Norwegian Ambassador in London, visited the British Thomson-Houston Co.'s main works at Rugby. On arrival, His Excellency was welcomed by Mr. K. R. Hopkirk, chief mechanical engineer, director, B.T.H., and then met Mr. E. H. Ball, managing director, and other directors. Mr. Prebensen saw many items of large plant in various stages of manufacture. Included was a 14,000 kVA 11 kV 500 r.p.m. horizontal waterwheel alternator for the Oldereid power station (Norway).

At the Overseas Association's annual dinner in the evening, held in the Masonic Hall, Rugby, the toast of the guests was proposed by Mr. C. F. Gimson, manager, Control Gear Engineering Department. Responding, Mr. Prebensen said that Norway, despite its lack of coal and oil, had become an industrial country due to its development of cheap and plentiful hydro-electric power. After referring to some of the plant he had seen in production in the earlier part of the day His Excellency concluded with a word of appreciation of the training schemes for apprentices. The toast "The Company" was proposed by Mr. C. W. Gunson, engineering apprentice from Kenya, the response being by Mr. G. S. C. Lucas, assistant chief electrical engineer. "The Association" was proposed by Mr. D. Edmundson, test engineer, and Mr. D. R. S. Turner, assistant manager, Turbine Sales Department, responded.

The Norwegian Ambassador inspecting the shaft for the 14,000 kVA waterwheel alternator for Oldereid power station. *Left to right:* **Mr. K. R. Hopkirk (chief mechanical engineer); Mr. J. N. MacDonald (executive director, B.T.H. (Export) Co.); the Ambassador; Mr. H. J. Timms (superintendent, generator and motor factories); and Mr. H. L. Satchell (director, manager, Rugby works)**

Batti-Wallahs' Society

A further distinguished name was added to the list of sportsmen who have addressed the Batti-Wallahs' Society, when at last week's luncheon, Mr. Rex Alston, the B.B.C. cricket commentator, gave an interesting talk on some of his experiences while acting as a commentator at test matches, from which we gathered that there have been occasions when he has extricated himself with skill from the snares of "batting on a sticky wicket."

Mr. T. C. F. Bigland (the "Mate") announced that the ladies' night will be held on 18th March next.

Change of Name

The name of the V.G. Manufacturing Co., Ltd., Park Royal, London, N.W.10, has been changed to the V.G. Porcelain Co., Ltd.

Economy in Softwood

No. 4 of the Ministry of Works series of Economy Memoranda imposes restrictions on the use of softwood in over 50 operations in building work and suggests substitutes. Among the items dealt with are cooling tower casings. It is stipulated that softwood is to be used only

for repair of existing towers and where it is essential for irrigation stacks in new towers. Another item is wiring casing for which the use of plastic material or hardwood is suggested.

Copper Sales

After reviewing the United Kingdom supply situation in the light of the present Rhodesian strike, the Ministry of Materials does not propose to reduce the quantity of copper which consumers may buy from the Ministry, within the limits of their individual allocations, for delivery to their works in November. It is hoped that no reduction will be necessary in respect of December deliveries but owing to the uncertainties of the situation forward purchases for December delivery will for the time being be limited to three-quarters of November allocations. A further announcement about purchases for December delivery will be made in due course.

Waterproof Corrugated Fibreboard

Many electrical manufacturers faced with packing problems will be interested in the new waterproof corrugated fibreboard made by the Thompson & Norris Mfg. Co., Ltd., Great West Road, Brentford. Containers made from the board have been undergoing exhaustive tests for over twelve months, being subjected to severe climatic conditions. The material stands up to a soaking for an indefinite time without undue weakening or tendency to disintegrate. Apart from their waterproof properties, containers made from the board combine a lightness with remarkable strength.

Amateur Wiring Causes Death

A warning against amateur electrical wiring was given by the Birmingham Coroner at an inquest last Friday on Robert Heath (62) and his wife Florence (61), of Sandbourne Road, Alum Rock, who were electrocuted in their home on 28th October. Mr. Heath heard his wife scream after she had put her wet hand on an electric fire, went downstairs and with bare feet entered the room in which she was washing the floor. He tried to pull the fire away from his wife and was electrocuted. It was found that the whole of the electric fire frame must have been alive to earth as the insulation at the top of the element had broken down. There was no earthing. The Coroner recorded a verdict of "Accidental death" and said that the wiring was "appalling and amateurish."

Lighting Equipment Display

Following a successful exhibition of "Atlas" lighting equipment held two years ago at Croydon in a public hall a similar display was arranged last week, this time in the showrooms of Drubel Distributors, Ltd., 19–24, Stafford Road, Waddon. Items of particular interest were a display unit designed to demonstrate the effects produced by the use of fluorescent powders subjected to ultra violet light, a working model indicating the scope of fluorescent stage lighting, and various appliances such as a photoprint unit and an X-ray viewing cabinet demonstrating special applications of 2ft fluorescent tubes. With these special features were a display of over thirty different types of lighting fittings, together with examples of coloured fluorescent tubes and tungsten lamps.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £166 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8¾d
Sheet	ton £329 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £93 10s 0d
Foreign	ton £92 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £958 0s 0d
ZINC, G.O.B. Foreign	ton £110 0s 0d
Electrolytic	ton £114 0s 0d
BRASS Tubes	lb 2s 2¾d
Sheet	lb 2s 5⅞d
Wire	lb 2s 8⅝d
PHOSPHOR BRONZE	
Wire	lb 4s 1¼d
RUBBER, No. 1 R.S.S. spot ..	lb 22½–22¾d

Reduced Price of Tungsten Ores

The Ministry of Materials has announced that from 31st October its selling prices for tungsten ores of standard 65 per cent grade and ordinary quality per long ton unit delivered consumers' works, will be:—Wolframite, 432s 6d; scheelite, 422s 6d.

Zinc Price Lower

The Ministry of Materials has announced that from 29th October the price of good ordinary brand zinc has been reduced from £118 to £110 per ton delivered consumers' works. Premiums for higher grades remain unchanged.

Aluminium Scrap

The Minister of Supply has removed the price control on aluminium scrap as from 1st November.

S.W. Board Competition

For three years running a service centre in the South Western Electricity Board's Devon Sub-Area has won the annual display competition organized by the Board. Following the success of Dartmouth (1950) and Bude (1951) the service centre in Union Street, Torquay, has

won the area challenge cup in the 1952 contest. Penzance gained second place and Taunton third. Highly-commended certificates were awarded to Barnstaple, Ilminster, Minehead and Bristol North (Whiteladies Road). The scope of the display competition was widened this year to include the interiors of Service Centres with the object of providing the best possible service with the greatest convenience to consumers. The judges were Mr. A. J. Symes (editor, *Display*), Mr. A. Baird (display designer, Decor Contemporary Art & Design, Ltd.), and Mrs. Frank Forrest (E.A.W.).

S.E.B. Convention

Forty Southern Electricity Board graduates and engineers attended the third graduate and engineers' convention held at the head office in Maidenhead on 28th and 29th October. The convention was opened by Dr. A. G. Beverstock, area education officer, and Mr. R. R. B. Brown, deputy chairman, gave a survey of the progress of the Board. Mr. K. Dannenberg, director of E.M.P. Electric, Ltd., spoke on "H.V. Fuse-Switches and Lightning Arrestors," and Mr. W. G. Hawley, high voltage research manager, British Insulated Callender's Cables, Ltd., dealt with "High Voltage Cables—Research and Development." On the second day, Mr. R. B. Sully, the Board's purchasing officer, reviewed "Purchasing Procedure"; Mr. C. O. Garton, head of the Materials Department, Electrical Research Association, dealt with "Insulating Materials," and Mr. J. M. Goodall, chief switchgear engineer, B.T.H. Co., Ltd., gave a general review of e.h.v. switchgear.

Trade Announcements

Electrical & Allied Distributors (N.I.), Ltd., 94, Great Victoria Street, Belfast, Northern Ireland, have been appointed by **Unity Heating, Ltd.**, as agents for its domestic, industrial and temperature control heating equipment for the Northern Ireland territory.

Bowthorpe Holdings, Ltd., has purchased the entire shareholding of Cheltenham Plastics, Ltd., and can now offer, in addition to the injection mouldings and tubings made by its subsidiary company, Hellermann, Ltd., a wide range of p.v.c. extrusions, including tubing.

Chilton Electric Products, Ltd., has appointed Andrew Sloss, Ltd., 15, Wellington Street, Glasgow, C.2, to handle its circuit breakers and Baker, Duthie & Co., Ltd., 131, West Regent Street, Glasgow, C.2, to handle its electric dry shavers in Scotland. Andrew Sloss, Ltd., have appointed Mr. J. L. Scudder to deal with all circuit breaker inquiries in the Scottish areas.

Agro Electrical Co., Ltd., has appointed Mr. J. B. Ridley, 4, Manor Drive, Longbenton, Newcastle-on-Tyne, 7, to act as its agent in the counties of Northumberland, Durham, Westmorland, Cumberland and Yorkshire.

Catalogues and Lists

W. Edwards & Co. (London), Ltd., Worsley Bridge Road, Lower Sydenham, London, S.E.26.—Five leaflets dealing with rotary piston model P2 (A.111/2), vacuum pipe line units (A.106/3), vacuum pumping units (E.112/1), "Circseal" glass cone joints for high vacuum (C.103/1) and "Speedivac" educational equipment (A.116/1).

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—Four "Lundberg" specification sheets featuring the "Speedy" d.p. switch (LA.1960); "Duplex" and intermediate switches (LA.1961); d.p. change over and "Tripolit" triple-pole switches (LA.1962); and series parallel switches (LA.1963). Specification sheet illustrating the "Creda" R.306 cooker (C.1939).

J. H. Fenner & Co., Ltd., V-Belt Sales Division, Hull.—80-page indexed catalogue relating to Fenner V-belt drives and pulleys (120/12).

Automatic Telephone & Electric Co., Ltd., Strowger Works, Liverpool, 7.—Illustrated pamphlet on staff location by visual indicators (1187) and a pamphlet dealing with automatic dial telephones (1151).

Transradio, Ltd., 138a, Cromwell Road, London, S.W.7.—Priced leaflets dealing with a range of "Co-ax" precision and U.S. type co-axial connectors (TR7B-8B).

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Illustrated catalogue dealing with electrical equipment for trolley buses (P1853).

Sturtevant Engineering Co., Ltd., Southern House, Cannon Street, London, E.C.4.—Illustrated technical booklet relating to Sturtevant positive ventilation (3702).

Smart & Brown (Engineers), Ltd., 8, Rose & Crown Yard, King Street, St. James's, London, S.W.1.—One broadsheet and five leaflets appertaining to fluorescent fittings and control gear.

W. T. Glover & Co., Ltd., Trafford Park, Manchester, 17.—Illustrated technical folder dealing with aluminium stranded conductors for mains cables including the soldering method of jointing.

British Engraving & Nameplate Manufacturing Co. (London), Ltd., 13/32, Tottenham Street, London, W.1.—Folder illustrating a wide range of engraved nameplates.

British Geon, Ltd., 21, St. James's Square, London, S.W.1.—Catalogue giving preliminary information on "Geon" resins 101EP and 103EP (G.13).

Keith Blackman, Ltd., Mill Mead Road, London, N.17.—"Heavy Fan Engineering"—a catalogue illustrating the larger types of "Tornado" fan engineering equipment (25).

Solar Energy

Its Use for Generation of Electricity Unlikely

THE world's known reserves of mineable coal are estimated to be sufficient for 2,000 years at the present rate of consumption. In spite of these immense total resources, there is a shortage of fuel in many places, due partly to the uneven distribution of deposits and partly to the unpopularity of coal mining. Much attention has therefore been devoted to the possibilities presented by alternative sources of power and heat, among them being solar energy.

The amount of heat arriving from the sun at the outside of the earth's atmosphere varies only slightly and is on the average 1·35 kW/m². The amount of energy reaching the ground near sea level depends on the sun's altitude, the cloudiness and the state of the atmosphere. The receipt of energy may reach 1 kW/m², but in most places it cannot be expected to average more than 0·1–0·2 kW/m². It will, of course, be zero for more than half the time. If this energy could be economically used we should have a new source of power and heat, which would be particularly valuable to countries with inadequate fuel supplies. Work on solar energy has already been undertaken in the United States, Great Britain, Germany and France and some prominence was accorded to the subject at the last British Commonwealth Scientific Conference.

Committee's Conclusions

Because of the potential importance of this field of research a committee, with Dr. E. C. Bullard, F.R.S., as chairman, was appointed to investigate the possibilities of using solar energy and to decide whether further work should be undertaken or sponsored by the Department of Scientific and Industrial Research. The committee's report has just been published and it is scarcely encouraging.

The subject has a large literature and many small-scale projects are recorded, but, so far as the committee is aware, solar energy is nowhere used on any considerable scale for heating or for the production of power. The main obstacles are the intermittency of sunlight, the fact that least energy is available when it is most wanted for heating, and the high capital cost of the collectors, which is a consequence of the large areas needed. The committee concludes that hydro-electric power is likely to be the source from which areas without coal will derive most of their power requirements. It is considered unlikely that solar energy can be an important source of heat or power in the near future, though some applications might be feasible in specially favourable circumstances. The availability of very modest amounts of power would have important and beneficial effects on the economy of tropical agricultural areas.

Intermittent Power Applications

Owing to the intermittency of the supply, the direct use of solar energy for driving engines for large power plants need not be considered. There are, however, a number of purposes for which intermittent power as low as 1 kW would be useful. In particular, the economy of the Indian village might be profoundly affected by the availability of such prime movers for water pumping. It is calculated, however, that for a power of 1 kW the area required to drive a small engine at about 200 deg C would be 18 m², which would make the scheme too expensive for use in peasant agriculture. This conclusion might be modified if a suitable flat-plate collector could be developed. The committee concludes that orthodox heat engines driven directly by solar power are not immediately practicable.

Consideration has also been given to the direct generation of electricity by solar power without first converting it into mechanical energy. There are three known ways of doing this: by the thermo-electric effect, by a photo-voltaic cell, and by the photo-galvanic effect. With existing materials the efficiency of the conversion of absorbed heat into electric power is about a quarter of the thermodynamic

efficiency, or rather less than that of a small steam engine working between the same temperatures. This might be raised slightly by the production of improved thermo-electric materials, but it seems unlikely that the scheme could be made substantially more efficient than the steam engine. It has other disadvantages. With a temperature difference of 200 deg C and the very high thermo-electric power of 4×10^{-4} volts/deg C, 250 junctions would be required to produce 20 V, of which only 10 V would appear in the external circuit. If a power of 1 kW were required these 250 junctions would have to have a resistance of less than 0·1 ohm. The equipment would obviously be very complex and a large bulk of relatively expensive materials would be needed. The disposal of the large amount of unused heat would present a serious practical difficulty.

Photo-Voltaic Cells

The efficiency of photo-voltaic cells is determined by the quantum yield and by the fraction of the energy of the quantum that is converted into energy of the electron. Selenium is the most favourable of known materials and its quantum yield is up to 75 per cent. The fraction of the energy of the quantum converted may be as high as 15 per cent. Of the power produced only about 36 per cent appears in the external circuit when the conditions are adjusted for the highest efficiency. These figures represent an efficiency of 4·1 per cent at the most favourable region of the spectrum (in the green), but the use of sunlight reduces the efficiency to 0·53 per cent. This figure gives 1·1 W/m² for an average incident energy of 0·2 kW/m², and a peak of 6 W/m². This very low figure can be improved only by extending the spectral range of the cell into the infra-red without sacrificing its other properties.

It is possible, in principle, to construct a photo-galvanic cell in which a chemical change is stimulated by sunlight, and which in consequence possesses electrical power, but the little that is known about these systems makes it appear most unlikely that they could be developed into an efficient source of power.

The use of solar energy to produce fuel which is subsequently used in an engine is regarded as attractive, since it avoids the consequences of the intermittency of sunlight and allows the energy to be used in applications requiring the continuous production of power. The efficiency of the utilization of sunlight by growing plants is remarkable. *Eucalyptus globulus* in India gives 9·4 tons of wood per acre per year. The wood has a calorific value of 5,000 cal/gm. The rate of storage of energy in the wood of an Indian eucalyptus forest is therefore 1·6 W/m², or 0·8 per cent of the energy reaching the ground. The yield from annual plants is of the same order.

If the wood of a eucalyptus forest was burnt and used for a small steam engine with a boiler efficiency of 70 per cent and an engine efficiency of 14 per cent, it would yield 0·15 W per square metre of forest. A comparison is made in the report between the advantages of the wood-fired steam engine for irrigation and those of the bullock, which is the commonest method of obtaining power on small holdings in India. It is concluded that from the thermodynamic aspect the wood-fired steam engine has advantages and the committee recommends that a small engine to be fired by vegetable matter should be designed.

The production of large amounts of power by burning wood is in principle possible. To produce 10,000 kW with a power station having an overall efficiency of 32 per cent would require 20 km² of forest, i.e., this area of forest could yield every year, for ever, enough wood to fire the boilers. The project does not appear attractive, but is not entirely impracticable. The widespread use of plants as a source of power would require so large an area of ground as seriously to affect the area available for growing food.

It has been suggested that some form of plant could be grown in tanks and continuously withdrawn and burnt or fermented to alcohol. The attraction of this scheme is that it might provide a process by which mechanical or electrical energy could be obtained continuously from sunlight without the consumption of any material substance. Calculations given in the report yield the following figures for the production of power by continuous photo-synthesis:

	Per cent	W/m²
Solar constant	100	1,300
Yearly average	15	200
7·5 per cent transformed to chemical energy	1·1	15
Useful heat	0·8	10
Useful work	0·26	3·2

Owing to its complication such a scheme would be possible only on a fairly large

scale. A power station producing 10,000 kW would need 3·1 km² of tanks and the volume of water required would probably be of the order of $0{\cdot}9 \times 10^6$ cubic metres. On these figures the scheme is clearly impracticable. A reduction at least by a factor of 10 is necessary and on present evidence such substantial improvements do not seem possible. If the cost of fuel became very much greater, such possibilities might require serious consideration.

It has been shown that in California a 6·6 m² heater will provide domestic hot water for 270 days in the year, additional heating being required on the other days. Solar water heaters have been on the market in the United States for many years, but are used only on a limited scale, probably because the cost of water heating by other means is not high enough to warrant the capital expenditure on a solar heater and large storage tank, in addition to a heater of normal type.

No one is likely to cook by solar energy if he can get gas, electricity, fuel oil, coal or wood. It might be feasible, however, to construct a solar stove capable of cooking the simple meals of Indian villagers. A stove using a mirror and pressure cooker has, in fact, been built by the Indian National Physical Laboratory, but it is not certain whether a suitable device could be built at a price that an Indian villager could pay.

It seems impracticable to use solar energy directly as the sole source of power for a domestic refrigerator for preserving food, since operation must be continuous. The use of solar energy for air conditioning is more attractive, since it is not essential that the system should run continuously, and the development of air conditioning equipment driven by solar power is regarded as worth consideration.

The committee is unable to suggest any line of research and development likely to lead in the near future to the use of solar energy as a large-scale source of power.

Modern Power Practice

I.E.E. Supply Section Chairman's Address

IN his inaugural address as chairman of the Supply Section of the Institution of Electrical Engineers Mr. C. M. Cock (English Electric Co., Ltd.) began by drawing attention to the main features of the larger sizes of boilers, steam turbines and water turbines now being installed in power stations. He then pointed out that the large, heavy, low speed diesel engine had never been able to compete on grounds of economy with steam turbine sets as installed in power stations, but the ability to place the power generator close to the load frequently meant greater economy in operation; very large numbers of such sets had been installed throughout the world for emergency and peak load service, for lighting and power in small towns, for pumping and other general purposes.

If the gas turbine could be made to run efficiently and reliably on commercial grades of heavy fuel oil it might well become a suitable prime mover for high power ship propulsion and locomotives. Similarly, if the coal-burning gas turbine proved itself, it might be suitable for locomotives and might be the ideal machine for pit-head generation of power. For the latter purpose it would have the following advantages: (*a*) High efficiency in units of moderate power, (*b*) ability to operate without a water supply, (*c*) less sensitivity than steam plant to moisture in low-grade coal, (*d*) high-value waste heat as a by-product suitable for coal drying or other coal up-grading processes, and (*e*), in appropriate cases, a striking saving of fuel by making use of the proportion of methane in the upcast air.

The former tendency to generate directly at 33 kV had ceased with the development of large interconnected transmission networks operating at high voltages, which removed the advantage, both in manufacture and operation, of h.v. generation.

A recent development which promised greatly to extend the upper limit of alternator output while keeping within

present mechanical-design limitations was the use of hollow conductors, both in the stator and the rotor, through which hydrogen was forced at high velocity. It was estimated that it would be possible to design single units to run at 3,600 r.p.m. in ratings up to 275 MW with characteristics suitable for large interconnected systems. At the same time, the reduction in physical size of the generating units for a given rating assisted in the conservation of copper and steel.

There was keen technical competition between the exponents of the various types of circuit breaker and it was not possible to forecast which type would lead ten years hence. The air blast type would appear to be the best for voltages of 300–400 kV.

The 275 kV grid scheme would include about 12,000 MVA of transformer capacity by 1960. The first, now being built, were 120 MVA three-phase units, auto-connected for a ratio of 275/132 kV. It was possible that in future substations there would be 180 MVA transformers and special design might permit them to be built as three-phase units. Transport was the only practical limit to size; unfortunately the Ministry of Transport had decided that the total load, inclusive of the road vehicle, must be within 150 tons which limitation, if enforced too literally, would restrict electrical development. Full-scale testing facilities were available in Great Britain and both impulse and short-circuit tests had recently been made on a complete 74 MVA three-phase 132 kV transformer.

From rectifiers and d.c. conversion apparatus, Mr. Cock turned to a.c. overhead power lines, remarking that the overseas investment in the construction of transmission systems, both present and in prospect during the next decade, was enormous; it compared in magnitude with that for generation. A feature was the extent to which various countries were revising their regulations for and methods of designing overhead power lines with a view to rationalizing some of the existing anomalies and securing economies. New British regulations were likely to be introduced in the near future.

There was no doubt that a successful conclusion would be reached with contemporary development of cables for the highest transmission voltages yet contemplated. The limitations of a.c. cables were defined in E.R.A. report BT/111 and d.c. cables therefore held promise of a better utilization of materials. Converting equipment was the crux of this matter (the mercury arc rectifier being the most practical unit) and, since the two systems were essentially complementary, the choice would be on the relative economic and technical merits of each individual installation.

Short concluding references were made to wind, tidal and nuclear power.

B.E.A. Contracts

DURING the past month the British Electricity Authority has placed contracts for equipment for power stations, transforming stations, and transmission lines amounting in the aggregate to £11,064,963. The principal contracts include the following:—

Barking power station: Reconstruction of drains and sewers.—Sir Robert McAlpine & Sons.

Hackney station: Ferro-concrete framework for turbine house and switch house.—J. L. Keir & Co. One cooling tower.—Head Wrightson Processes.

St. Marylebone station: 30 MVA 66/11 kV transformers and auxiliary transformers.—Hackbridge & Hewittic Electric Co.

Portishead station, near Bristol: 3·3 kV and 415 V auxiliary switchgear.—English Electric Co.

Tilbury station: Coal handling plant.—Mitchell Engineering.

Castle Donington station, near Derby: Foundations and aqueducts.—Taylor Woodrow Construction. Three 830,000 lb/hr boilers and ash and dust handling plant.—Babcock & Wilcox.

Meaford "B" station, Stone, Staffs.: Superstructures.—C. Percy Trentham, Ltd. 11 kV and lower voltage cables and connections.—W. T. Henley's Telegraph Works Co.

Ocker Hill station, Tipton, Staffs.: Two 30 MW turbo-generators with feed water and condensing plants and auxiliary apparatus.—Richardsons, Westgarth & Co. Modifications to existing 33 kV switchgear and control room equipment.—British Thomson-Houston Co. Two 36 MVA generator transformers.—Ferranti.

Wolverhampton station: Uprating of 1,500 MVA 132 kV switchgear and provision of busbar protection.—General Electric Co.

Bold station, St. Helens: 3·3 kV and 415 V auxiliary switchgear.—English Electric Co.

Wallasey station: One 85,000 lb/hr oil fired boiler.—Yarrow & Co.

Skelton Grange station, Leeds: One cooling tower.—Film Cooling Tower (1925), Ltd. Extension of cooling water culverts.—Marples Ridgway and Partners.

Stella North station, near Newcastle-upon-Tyne: 132 kV transformers.—C. A. Parsons & Co.

Carrington station, near Manchester: Structural steelwork.—Sir Wm. Arrol & Co.

Huncoat station, Accrington: Foundations and circulating water ducts.—J. Jarvis & Sons.

Roosecote station, Barrow: 11·8 kV and lower voltage cables and accessories.—Drake & Gorham.

Portobello station, Edinburgh: One generator transformer.—Bruce Peebles & Co.

Clyde's Mill station, Glasgow: Two 30 MW turbo-generators and auxiliary apparatus.—English Electric Co. Structural steelwork.—Redpath Brown & Co.

Portishead substation, near Bristol: Site and foundation works.—Stone & Co. (Bristol), Ltd.

Goldington substation, Bedford: Site and foundation works.—Mitchell Construction Co.

Staythorpe substation, Newark: 275 kV 7,500 MVA switchgear.—Metropolitan-Vickers Electrical Co.

Irish Board's Report

Progress of Rural Electrification

THOUGH the first 20 MW set at the peat-fired station at Allenwood was brought into commission early in the year, followed by a 22·5 MW hydro-electric generator at Cathaleen's Falls, the Irish Electricity Supply Board had to reintroduce rationing during part of 1951–52. At the beginning of the year the demand was sustained at a level 30 per cent higher than in the preceding year, the main factor being the exceptional heating demand brought about by the shortage and high price of other fuels. Plant maintenance was interfered with to some extent by the refusal of mechanical fitters to work overtime.

More Plant Commissioned

Second sets have since been started up at both the Allenwood and Cathaleen's Falls stations and the Board's report—its twenty-fifth—anticipates that a further 35 MW will be available early next year from the oil-fired North Wall (Dublin) station. Notwithstanding delays in the delivery of plant and steel, steady progress has been maintained on the new thermal stations at Cork and Dublin (Ringsend) which will strengthen the system capacity by 150 MW. Altogether new plant being designed or constructed aggregates 301·5 MW compared with the total installed capacity at the end of March last of 308 MW. Plant placed in commission last year represented a capital investment of £10,120,656 compared with £4,881,573 in 1950–51.

Details of electricity production and sales are given in Table I. Hydro stations contributed 456 million kWh of the total output and steam stations 573 million kWh; 2·2 million kWh was purchased in bulk from the Electricity Board for Northern Ireland and 1·2 million elsewhere. The maximum load was 253,000 kW (against 251,000 kW).

Transmission of power from generating stations sited on the midland and western bogs to the main load centres in the east presents a number of problems and the adoption of a higher voltage than 110 kV for this purpose is being investigated. During the year 123 miles of 110 kV, 50 miles of 38 kV and 148 miles of 10 kV lines (excluding rural lines) were erected.

Table I.—OUTPUT AND SALES

Year ended 31st March	Million kWh generated and purchased	Million kWh sold	Total consumers	Average price d/kWh sold
1947	571·9	153·7	248,030	1·90
1948	620·0	492·1	262,598	1·88
1949	710·2	569·3	284,198	1·83
1950	784·8	626·2	310,639	1·83
1951	973·0	770·1	343,376	1·71
1952	1,032·7	835·3	372,743	1·88

Table II.—RURAL DEVELOPMENT

Year ended 31st March	Work done during year			
	Poles erected	Miles of line strung	Consumers connected	Areas completed
1947	1,300	39	Nil	Nil
1948	15,986	721	2,203	7
1949	32,002	1,730	9,262	30
1950	40,972	2,083	13,688	45
1951	42,423	2,232	15,803	49
1952	46,008	2,466	18,067	49
Totals to date	178,691	9,271	59,023	180
Transfers			2,970	
Total			61,993	

Rural Sales Doubled

Table II summarizes the progress of the rural electrification scheme, applications for supply under which continued to be received in large numbers. By the end of the year 413 areas had been investigated and 211, covering 5,351 sq miles, had been developed or selected for development. Capital expenditure on the scheme last year amounted to £1,341,924 and the total invested up to 31st March was £5,166,758, towards which subsidies amounting to £2,500,000 had been received from the Ministry for Finance. Rural sales (50·8 million kWh) were double the 1950–51 figure and in consequence the average price

paid decreased from 3·38d to 2·92d/kWh sold. The impetus given to piped water supplies by the Department of Agriculture grant scheme aroused considerable interest in electricity for pumping. Self-contained grain grinders had been popular but they became virtually unmarketable owing to a large increase in price and a number of grinders suitable for independent motor drive were bought instead.

The Board's accounts record a gross revenue of £6,570,622 and working expenses (including depreciation) of £5,364,626, while interest and repayment of capital advances came to £1,205,034, leaving a surplus of £962, against £514,107 in the preceding year. To meet higher fuel costs, increased charges were brought into operation during the year. On the merchandise trading account there was a surplus of £29,474, sales of appliances amounting to £383,399 (against £381,821 in 1950–51). The value of work carried out on installation trading account was £334,143 (against £279,163), there being a net profit of £15,502.

This year the accounts are presented in a new form in view of the desirability of showing separately the result of rural electrification which is subsidized by the State. The problem of provision for renewals of plant was the subject of special examination during the year because of the high price of new installations.

Fuel Research

THE first post-war annual report (for 1950) of the Fuel Research Board and of the Director of Fuel Research has been issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, 2s 6d).

Among the investigations reported is one, initiated by the British Electricity Authority, concerning the effects of chlorine in coal in relation to ash content on the formation of bonded deposits in pulverized-fuel boilers. Evidence of harmful effects, when the proportion of ash in the coal was high enough to dilute the material which caused bonding, was not conclusively shown. Availability of a stoker-fired boiler at Burton-on-Trent power station was improved by limiting fuel supply to one uniform grade.

At another power station two similar boilers were fired with different coals: one with coal containing over 1·8 per cent of sulphur and less than 0·15 per cent of chlorine, the second with coal containing 1·3 to 1·8 per cent sulphur and 0·3 per cent chlorine. Both were almost free from deposit, though corrosion in the air heater was serious with high sulphur coal. Tests are now being carried out with coal of high chlorine and low sulphur contents.

Experimental work on gas turbines is chiefly in the development of two types of combustion chamber for pulverized fuel—the vortex and the straight-through. Both operate without slagging and burn 500 lb/hr of fuel at atmospheric pressure, corresponding to 2,000 lb/hr under pressure for a power output of 2,000 h.p. A cyclone combustion chamber for burning crushed (not pulverized) coal is being developed.

The influence of vanadium compounds on the formation of oxide scale and the inhibition of the latter; heat exchangers; and dust extractors are among several further investigations regarding gas turbines.

Surveys of sulphur dioxide near ground level indicate that no reduction in concentration over S.W. London has resulted from the reinstatement in 1946 of flue-gas washing for two-thirds of the total effluent gas at Battersea power station; improvement may, however, have been masked by the considerable increase in fuel consumption at the Battersea and Fulham stations.

Among the tests on domestic heating appliances was one for the B.E.A. which indicated that the temperature within a cabinet of the calorimeter building at the end of one hour was nearly 2 deg F higher with an electric convector than with a reflector fire.

To meet the shortage of supplies and reserves of the best coking coal, research is being done on the blending of weakly caking coal.

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons last week Mr. Geoffrey Lloyd, Minister of Fuel and Power, moved "that this House takes note of the Report of the [Ridley] Committee on national policy for the use of fuel and power resources and also takes note of the last annual reports of the nationalized fuel and power industries."

After paying a tribute to the work of the Ridley Committee, he pointed out that the Committee had found that the idea that the present balance between the use of different fuels meant waste of coal and capital resources had often been grossly exaggerated. The Committee was in favour of the continuation of competition between the fuel and power industries, and strongly in favour, within a proper framework, of the maintenance of full freedom of choice for the consumer. It had rejected the ideas of a super-planning board to control the nationalized industries. It noted that there was already a good deal of co-operation between the nationalized industries. The British Electricity Authority and the National Coal Board were co-operating in the siting of new power stations in the coalfields and also in special power stations to utilize very low-grade coal. Both of these bodies, with the Gas Council, were co-operating to see whether it was possible to use very low-grade coal deposits, particularly in Scotland.

He proposed to move as fast as he could with the Committee's recommendation for the expansion of the fuel efficiency service of the Ministry.

In regard to domestic consumption, remarkable progress had been made in the production and distribution of improved types of grate. Rough small coal was in such good demand that it was proposed to free its sale from all restrictions as from 1st December. Stocks of coke were also good and the maximum amount of boiler fuel per householder would be increased.

Former Minister's Views

Mr. Noel-Baker (Labour) said that there should be a compulsory change from gas to electricity for street lighting. Fluorescent tubes instead of filament lamps would mean an even greater saving of coal. On the railways he would press on with diesel shunters and the electrification of suburban lines.

We ought to have three times the amount of electricity that we had in our factories to be on an equal footing with the United States. We were also far behind Switzerland, Sweden and Norway. The housewife wanted electric power for vacuum cleaners, for washing machines and for many other things which gas could not supply. He believed that the Government and Parliament should consider whether for the next period of years domestic heating would not be a curse to the B.E.A., as quite certainly it was two years ago, and whether in the national interest they ought not to seek by more positive and active measures to promote the use of gas.

With regard to industry he was sorry that the Government this year went back to the old standards of load-shedding. He believed that more double-shift work and other load-spreading devices were an essential part of any long-term plan for increased production and industrial efficiency.

Water Power Development Advocated

Mr. Ellis Smith (Labour) urged the greater use of water power in this country. He asked if the Ridley Committee had consulted Metropolitan-Vickers, the British Thomson-Houston Co. and the English Electric Co., three concerns manufacturing the most efficient hydro-electric plant.

Mr. Nabarro (Conservative) said that he supported Lord Citrine in his repeated demands since 1947 for very large sums of money for capital investment in new generating plant and power houses, provided that new power was used primarily for factory production and also for lighting, for minor domestic appliances, for intermittent and occasional space heating, but never for continuous space heating or water heating. The first call on capital investment resources ought to be given to the B.E.A. for a power house expansion programme to work up to the desirable figure of 1,800 MW of new installed capacity, but only providing that the B.E.A. would desist in its endeavour to sell electricity for space heating, cooking and water heating. Generally speaking, gas was always twice as efficient as electricity for these domestic purposes. It would also be necessary to encourage further development of independent generation.

He suggested that the B.E.A. should install a trial district heating system with back pressure turbines based on a B.E.A. power house.

Mr. Alfred Robens (Labour) said that constant space heating by gas and electricity was not an economical use of coal. Solid fuel should be used for main heating and main hot water supplies, and gas and electricity used for topping-up, seasonal work and so on. They would never get rid of the peak until they took

the commercial people engaged in the sale of electricity firmly in hand and told them to stop selling a commodity which they had not got.

Mr. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, replying to the debate, promised consideration of all the points raised. Referring to electricity tariffs, he said that there was an obligation on the nationalized industries to standardize tariffs, and that was what had been going on. But it might well be that in reducing the enormous number of tariffs which existed before nationalization they had gone too far. The Boards had undertaken to review the new tariffs as soon as they had had sufficient experience of how they worked.

The South Eastern Board reduced the number of its employees by 165 during the last year, although it increased the number of consumers by 27,000. The Southern Board had increased consumers by 36,000 and reduced the number of employees by 135. The Yorkshire Board had reduced the number of employees by 182. All these things had been achieved by a consolidation of the organization, by a reduction of small meter testing stations, the amalgamation of small districts and so forth. The Electricity Boards were already proposing to terminate the restrictions on the use of private generating plant.

The motion was agreed to.

Radio Relay Apparatus Tax

Mr. Boyd-Carpenter, the Financial Secretary to the Treasury, moved that the House should approve the Purchase Tax (No. 2) Order, 1952 (S.I. 1952 No. 1423) dated 29th July, 1952. He said that the effect of the Order was to place beyond doubt the fact that radio relay apparatus was treated in the same way for purchase tax purposes as the ordinary wireless receiving set or the radio-gramophone.

Cost of North Wales Schemes

Mr. Geoffrey Lloyd told Mr. Nabarro that he was informed by the British Electricity Authority that the estimated capital cost, at current prices, of the extension at Dolgarrog was £538,000 and of the extension at Maentwrog £565,000. At Dolgarrog there would be an increase in installed capacity of 10,000 kW. The extension at Maentwrog was intended to allow more power to be generated from the existing plant.

Mr. Nabarro asked what sums the Minister had sanctioned for capital investment in 1953 in respect of hydro-electric works in North Wales and Snowdonia, excluding Dolgarrog and Maentwrog; and whether his permission had now been given to the British Electricity Authority to introduce further private Bills to give legislative effect to the proposals.

Mr. Geoffrey Lloyd said he did not sanction capital investment separately for individual power stations and therefore the first part of the question did not arise. He understood that the British Electricity Authority had not yet decided whether to proceed with further legislation at present.

Fuel Price Increases

Answering Mr. Arthur Lewis, Mr. Geoffrey Lloyd said it was not practicable to give details of changes in fuel and power prices, which varied with the locality and with the nature and quality of the supply, but the data collected by the Ministry of Labour showed average increases in retail prices between 18th September, 1951, and 16th September, 1952, of 8 per cent for coal, 9 per cent for coke and gas, and 13 per cent for electricity.

Television Relay Stations

Mr. Charles Taylor asked the Assistant Postmaster-General what plans for television relay stations to improve reception in southern England had been submitted to him; and what action he proposed to take.

Mr. Gammans said that two applications for television rediffusion service had been received and two for radio boosters; the whole question of improving reception in fringe areas was under consideration.

Television Committee Reconstituted

The Postmaster-General announced in the House of Lords on 29th October that he had reconstituted the Television Advisory Committee to advise him on the development of television and sound broadcasting at frequencies above 30 Mc/s, and related matters, including competitive television services and television for public showing in cinemas and elsewhere. The chairman is Admiral Sir Charles Daniel and the members are Sir Edward Herbert, Mr. C. McLaren, Mr. E. M. Fraser, Messrs. G. Darnley Smith and C. O. Stanley (Radio Industry Council), the Director-General of the B.B.C., and senior officials from the Treasury, the Post Office and the Ministry of Supply.

Development in Canada

ELECTRICITY generated by Canadian central power stations advanced by 71 per cent in the period from 1939 to 1950, while revenues rose by 113 per cent, according to the annual report on the central electric station industry by the Dominion Bureau of Statistics. The number of domestic customers served also rose appreciably in all classes, including farm service, with an increase of 72 per cent. The average consumption of domestic customers increased by almost 70 per cent in the eleven years. Revenues rose from $151,881,000 in 1939 to $323,833,000 in 1950, while electricity generated advanced from 28,338 million to 48,494 million kWh.

ELECTRICITY IN THE AREAS

Sales and Costs : Value of Domestic Load

NORTH EASTERN

IN the predominantly industrial North Eastern Area 3,256 million kWh was sold last year compared with 3,064 million in 1950–51, an increase of 7·1 per cent. In the latter part of the year the rate of increase in sales contracted markedly. Commenting on this and the upward trend of costs, the Board's report says it is probable that an increase in tariffs cannot be long delayed.

The recession is attributed to a variety of causes, such as the milder winter, shortage of money and a slackening in some trades. Disappointment is felt at this tendency in view of the amount of development undertaken by the Board. Last year, despite restrictions on finance, 21,021 domestic premises were connected (including 14,500 new houses) and supplies were afforded to 20 new schools. Work proceeded steadily in the new towns of Peterlee and Newton Aycliffe. In rural areas, another 50 villages and hamlets were given a service and 389 farms of 5 acres or more were connected, though capital expenditure limitations made it necessary to suspend negotiations for supplying more than 300 farms.

During the year arrangements were concluded for furnishing supplies to 63,000 kW of mining and other industrial plant, representing an estimated annual consumption of 103·8 million kWh. The National Coal Board prepared five schemes for the concentration of output, involving the sinking of two new shafts and the installation of five coal preparation plants and new electric winders. Experiments were carried out during the year with new types of electrically operated mining equipment.

A comprehensive ten-year scheme of major system development was prepared covering among other things the reinforcement of the Board's 66 kV systems in Northumberland and Durham. A comprehensive programme of modernization of the 20 kV circuit breakers to increase their rupturing capacity has now been put in hand.

NORTH WESTERN

Some of the less obvious consequences of capital expenditure restrictions are pointed out by the North Western Electricity Board in its report. For instance, many people in urban areas who live near existing mains could be supplied with electricity at a comparatively small cost, providing a better return in relation to capital expended than in the case of new houses. Limitation of this type of development " must in the long run have an adverse effect on electricity charges." Then again, schemes which would have resulted in operational and administrative economies, such as the replacement of small dispersed workshops, stores and depots by central establishments, have had to be deferred.

Another matter to which timely attention is drawn is the need for a vigorous policy of domestic development to provide load diversity. Records taken by the Board at typical housing estates have proved that the load factor of domestic supplies is nearly double that of the majority of industrial supplies.

The number of new consumers connected during the year was 29,357, about 16 per cent less than in the previous year. They included 551 farms (against 605). Industrial sales expanded by 19·7 per cent, but three large supplies accounted for more than half the increase. In deciding the structure of its standard industrial tariffs the Board took into account the need to encourage high load factor and off-peak usage. Greater adoption of two- and three-shift working, says the report, would be in the overall interests of national productivity and would cheapen electricity supplies.

Details are given of reinforcement schemes undertaken and proposed. The largest approved during the year was the extension of the Fylde Coast 33 kV system costing nearly £700,000.

Research work undertaken by the Board included waveform analyses at various points which confirmed that harmonics due to large mercury arc rectifiers might adversely affect the operation of h.f. injection equipment.

Grain Drying

Large All-Electric Installation at Fakenham

TO meet the situation brought about by the increased use of combine harvesters, a new completely electrified granary has just been put into service at the establishment of Few & Co., Ltd., Fakenham, Norfolk, with a storage capacity of 2,000 tons and facilities for cleaning as well as ventilating and, if necessary, drying the grain being stored. Comprising 205 h.p. of motive power and 90 kW of heating, the installation has an exceptionally high load factor the estimated maximum demand being about 200 kVA. The plant is not yet in full operation but during the first month the maximum demand recorded was only 115 kVA with 7,970 kWh consumed.

Operation of the plant, which has been installed by J. L. Gandley, Ltd., is practically foolproof. Manual labour has been reduced to the minimum and precautions are taken to guard against possible overheating of the grain during the drying process. For convenience the plant has been divided into two identical units each capable of handling 10 tons an hour.

On arrival at the granary by rail or road the grain (wheat, oats or barley) is tipped into one of two 12-ton intake pits whence double bucket elevators (1½ h.p. motors) carry it to the first floor for passing through Robinson "Apex" pre-cleaners (2 h.p.) which remove the dust and greenstuff. Leaving the pre-cleaners the grain, the moisture content of which has been previously ascertained, is automatically weighed on Avery scales before passing into a pneumatic conveyor system (with 25 h.p. centrifugal fans) which takes it through a series of fixed ducts for eventual discharge through swivel ducts to any one of the twenty-eight silos.

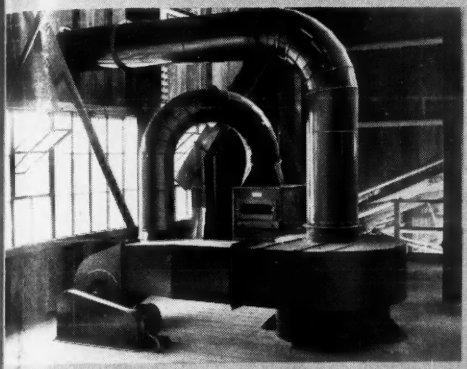
These silos, which are arranged in four rows of seven, are constructed of brick and concrete and are about 40ft high, with square sides. They are designed for self emptying, their sloping bases consisting of steel wedge wire grids through which air, conditioned according to the moisture content of the grain, can be injected by means of fans driven by 40 h.p. motors.

Banks of electric heating elements, loaded at 45 kW for each plant, are inserted in the air intake of the ventilating system. They have been designed by Bastian & Allen, Ltd., to operate at black heat and are automatically controlled in sections by Negretti & Zambra humidistats operating through Arrow Hart contactors. The humidity of the air is thus reduced to the desired figure without risk of overdrying the grain. The extraction rate of both units is 6 per cent reduction of moisture content from 200 tons of grain a week.

The efficiency of the ventilation system is such, however, that the grain can be safely stored at moisture contents above those normally considered possible for bulk storage and accordingly only the minimum of heating is required. For normal ventilation air can be passed through all the silos simultaneously, but the inlets to any individual silos can be shut off if desired. The centrifugal fans used for the ventilating system are driven by 40 h.p. motors.

From the silos the grain can be taken by a second pneumatic conveyor system, also

Opposite page: **(1) One of the pre-cleaning plants. (2) Preliminary weigher and conveying fan which blows the grain into storage. (3) Ventilating fan and air heater. (4) Conveying fans which suck the grain from storage to the separators. (5) Grain cleaning plant with rotary valves above. (6) The main switchboard**



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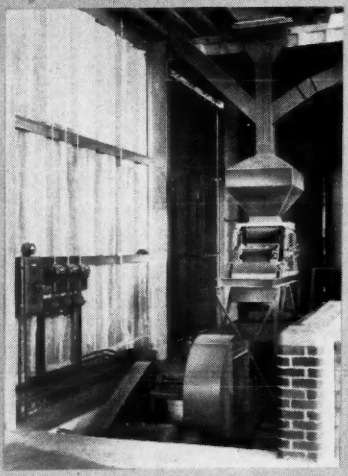

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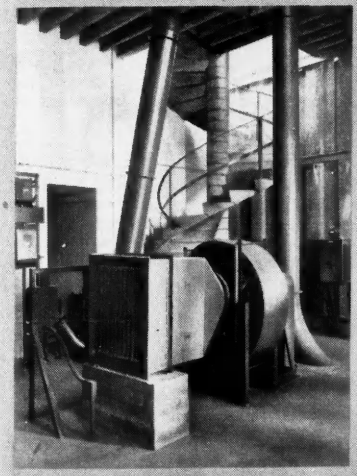

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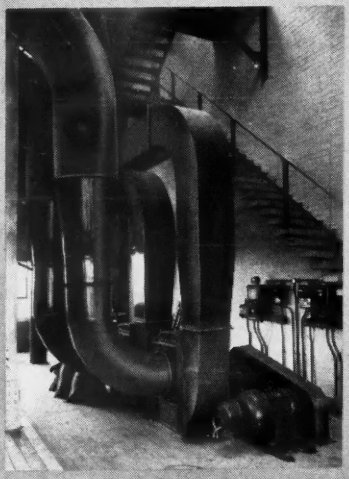

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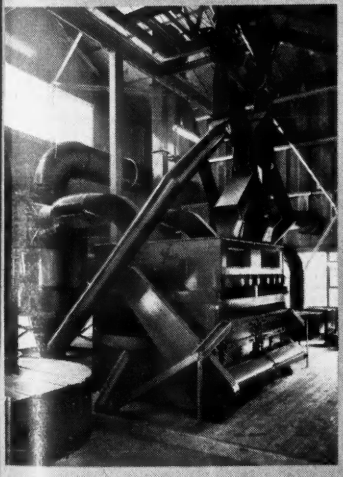

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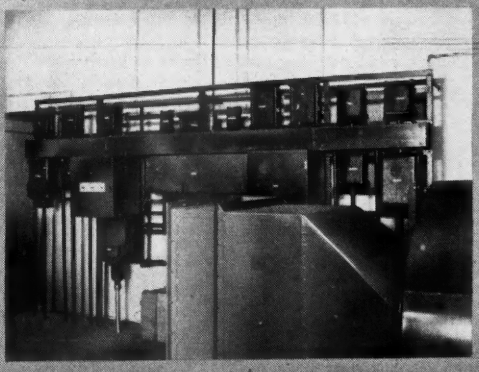
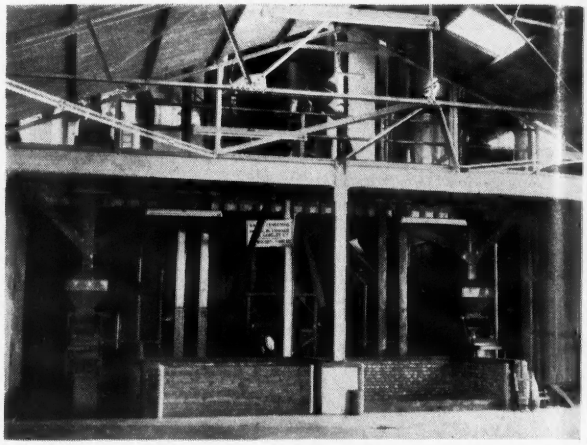


6

with 25 h.p. fans, to centrifugal collectors and thence through rotary valves (1 h.p.) to the main Robinson dressing machine (10 h.p.). The clean and graded grain then goes through a second automatic weighing machine to enable a comparison to be made with the intake figures. It is then either automatically sacked off or returned to the elevator for bulk loading to road or rail trucks, or to the silos.



A general view of the grain conveying and drying-in-storage installation showing two identical 10 ton/hour units

Throughout the installation Brook motors, mainly operating at 1,450 r.p.m., are used with Morecambe starting equipment, the controllers for the ventilating fans being provided with ammeters. Local switch-fuses are of various makes including G.E.C., Simplex, M.E.M. and Sanders. Emergency remote stop buttons are provided at strategic points. Lighting throughout is by means of Atlas fluorescent units.

The main switchboard has been designed by the Eastern Electricity Board which has been responsible for the whole of the electrical installation. Because of limited time a variety of different makes of equipment have been utilized, but the resulting assembly is of exceptionally neat appearance. The Cromer District of the Board is also to be commended on the speed with which the installation was completed.

The electricity supply for the granary is received from an outdoor substation immediately outside the building. Comprising a 250 kVA 11 kV/415/240 V English Electric transformer and a Crompton Parkinson "T.A.P." circuit breaker, it is designed also to serve other buildings in the neighbourhood.

WALSALL TRANSPORT PLAN

Extension of Trolley-Bus Services

A FIVE-YEAR plan to extend trolley-bus services in Walsall, which it is estimated will cost nearly half-a-million pounds, has been approved in principle and a special meeting of the Town Council has been called to consider a recommendation that application should be made to the Minister of Transport for a provisional order permitting the Corporation to implement the plan. The proposals, together with a special report by the transport manager (Mr. R. Edgley Cox), have been approved unanimously by the General Purposes Committee. The estimated capital expenditure on the scheme based on current prices of raw materials and labour, is £456,000, made up of £215,000 for trolley vehicles, £191,000 for overhead equipment and £50,000 for substation equipment. It is pointed out that while it is unlikely that there will be much variation in the cost of vehicles, it is hoped that, as a result of technical developments, there will be some reduction in the cost of overhead equipment and possibly sub-station equipment.

ELECTRICITY SUPPLY

Welsh Schemes Postponed

Increased Cost of Belfast Project

PLANNING authorities in North Wales have been informed by the British Electricity Authority that capital restrictions will prevent its proceeding with the Rheidol and Ffestiniog hydro-electric schemes for which it had intended to promote Parliamentary Bills this session. It intends, however, to proceed with the extensions of the Dolgarrog and Maentwrog schemes which have already received Parliamentary sanction. It is hoped to invite tenders in connection with this work early in the New Year in order that it may commence in the spring.

Revised Belfast Estimate

The original estimated cost of Belfast Corporation's new Victoria power station was £4,215,759: now an additional £926,750 is required. The Electricity Committee decided last week, subject to the approval of the General Purposes and Finance Committee and confirmation by the City Council, to make application to the Ministry of Commerce for sanction to raise a supplementary loan to meet the extra cost. The estimate for civil engineering works is up by £293,500 to £1,372,050 and the new figure for plant and foundations is £3,770,459—an increase of £623,250.

Supply Terms

The Association of Municipal Corporations has expressed to the Ministry of Housing and Local Government dissatisfaction at the present practice of some Electricity Boards of requiring local authorities to make a capital contribution towards the cost of connecting supplies, or, alternatively, to install a minimum number of points. The Ministry has been requested to meet representatives of the Association in order to discuss this matter.

Italian Power Production

Statistics published in *Italian Affairs* (Rome) show that in 1951 the Italian power system produced 28,818 million kWh (26,181 million hydro-electric and 2,637 million thermo-electric or " geo-electric " (natural steam)). This compares with 24,445 million kWh in 1950 (21,540 million hydro-electric and 2,905 million thermo-electric, etc.). In 1944 and 1945, as the result of aerial bombardment and other war operations, the output fell to 13,106 and 12,365 million kWh respectively. Between 1944 and 1949 destroyed or damaged generating plants representing a capacity of 1,366 MW were reconstructed and in the same period new hydro-electric plants totalling 1,781 MW and thermal plants of 187 MW were established.

Kirkcudbright Reinforcement

The S.W. Scotland Electricity Board has approved a scheme, estimated to cost almost £92,000, for reinforcing the network between Congland, Castle Douglas, and Dalbeattie in Kirkcudbrightshire. This area is at present supplied from the hydro-electric power station at Congland by means of 11 kV overhead lines, but owing to the increase in load it has been decided to reinsulate the two lines between Congland and Dalbeattie, a distance of some 24 miles, to operate at 33 kV, and to erect 33/11 kV outdoor substations at both places. It is anticipated that the work will be completed by 1955.

Londonderry Extension

An extension costing £160,000 and comprising a 6,000 kW Metrovick turbo-alternator and a 50,000 lb/hr Yarrow boiler was formally inaugurated on Friday at Londonderry, when the Mayor (Ald. S. Orr, J.P.), members of the Corporation and representatives of the Government, the Northern Ireland Joint Electricity Committee and the Electricity Board for Northern Ireland made an official inspection of the municipal electricity undertaking.

Installations in Gas-Lit Houses

Newbury Corporation Housing Committee reports that some 308 pre-war houses, including those on the Camp Close, Monks' Lane, Skyllings, St. George's Avenue, and St. Michael's Road estates, still have gas lighting. It recommends that tenders should be invited for the installation of electricity in these houses.

Franco-Spanish Interchange

Electricité de France has been authorized to effect an interchange of electric power with the Spanish companies Energia e Industrias Aragonesa e Iberduero and Unidad Electrica.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Ferranti, Ltd.—The report and accounts for the year to 30th June last have now been published. These show a consolidated net profit of £529,208, as compared with £540,129 for 1950-51. Taxation absorbed £645,000. The net balance of the parent company is £376,303 (against £507,930). After allocating £300,000 to general reserve and £40,000 to reserve for doubtful debts, it is proposed to again pay an ordinary dividend of 6 per cent for the year. The consolidated balance carried forward is £270,063 (against £129,191 brought in).

In his statement which accompanies the report and accounts, Sir Vincent de Ferranti (chairman and managing director) says that the output of the group was more than 30 per cent above that of last year, and the turnover was approximately equally divided between home requirements, exports and armaments. There was a steady increase in orders received during the year, and the company is left with a record order book of over £15,000,000. Further extensions of manufacturing facilities are in hand, and the work on the new research laboratories at Wythenshawe is expected to be completed towards the end of the current financial year. Both the Canadian and American companies increased their output.

The output of power transformers was 26 per cent higher than that for last year, orders including nine 230 kV transformers for the Garrison Dam plant, North Dakota, and large transformers for the British Electricity Authority. Orders are in hand for nine impulse generators for over one million volts, including one for 3.2 million volts for the National Physical Laboratory. The turnover of the Insulation and Meter Departments has exceeded all previous records but import restrictions in foreign countries caused a decline in orders for meters towards the end of the financial year. The demand for castings, commercial instruments and special metering equipment continues to increase. An electronic digital computer has been installed at the University of Toronto, and orders for a further six of these machines are in hand. Their contribution towards the development of guided weapons is considerable.

The scheme for the development of the electronic industry in Scotland, in which they are responsible for a number of associate concerns, has been finally approved and building operations for the new laboratories will commence shortly. The Ministry of Supply has placed contracts for equipment for aircraft, and additional premises are being taken over so that they can expand the specialized valve development work for the Admiralty.

Crabtree Electrical Industries, Ltd., reports a group net profit for the year to 31st July last, after deducting £185,971 for taxation, of £114,494, as compared with £149,910 for the preceding year. It is proposed to pay a final ordinary dividend of 10 per cent, making 17½ per cent for the year. The dividend for the previous year was also 17½ per cent, composed of an interim payment of 5 per cent and a final distribution of 12½ per cent.

G. & J. Weir, Ltd., have declared an interim dividend of 5 per cent on £2,018,307 capital, as increased by a 200 per cent bonus issue. For the previous year the total distribution was 45 per cent, which included an interim payment of 10 per cent. The directors emphasise that the increased interim payment is being made to provide a more equal division between interim and final dividends and does not imply any increase in the total distribution.

The Electrolytic Zinc Co. of Australasia, Ltd., reports a net profit for the year to 30th June last, after providing £750,000 for amortization and depreciation, and £2,120,000 for taxation, of £2,112,491, as compared with £1,577,525 for 1950-51. After making various allocations, including £500,000 to reserve for new plant at Risdon, and £150,000 to general reserve, it is proposed to pay a final dividend on the preference and ordinary of 30 per cent, making 45 per cent for the year (against 35 per cent). The balance carried forward is £307,878 (against £288,244 brought in).

Aeronautical & General Instruments, Ltd., reports a consolidated trading profit for the year ended 31st March last of £39,495, as compared with £48,198 for the previous year, and after meeting all charges, including £17,250 for taxation, it is proposed to pay an ordinary dividend for the year of 5 per cent (unchanged). The balance carried forward is £28,461 (against £25,611 brought in).

Cable & Wireless (Holding), Ltd., announces that at meetings of the holders of the 3 per cent and 4 per cent loan stocks held on 30th October, sanction was given to the

creation and issue of the 5 per cent debenture stock, reference to which was made in our issue of 24th October. Accordingly the conversion scheme becomes effective.

Crompton Parkinson, Ltd., report that the audited accounts for the year to 30th June last show a net income taken to account by Crompton Parkinson, after charging depreciation, taxation and provisions, of £321,656, as compared with £304,583 for the preceding year. The consolidated net income of the group was £397,934 (against £361,315). In arriving at these figures provision has been made for the gross amount of the income tax charge for the year, before crediting the tax deductible from the distributions to stockholders. Appropriate adjustments have been made in the comparative figures for the previous year. In addition to the foregoing, provisions no longer required, and profits relating to previous periods, amounted to £152,000 (previous year £63,249). It is proposed to pay a final dividend and special cash bonus each of 3¾ per cent actual on the ordinary stock (previous year the same on the ordinary and then existing "A" ordinary stocks), making 11¼ per cent for the year.

The directors have also decided to recommend the payment of £10,000 to the trustees of the Central Benevolent Fund (previous year the same).

The British Electric Transformer Co., Ltd., report a net profit for the year ended 30th June last, after charging depreciation, taxation and provisions, of £34,059, as compared with £43,789 for the previous year. It is proposed to pay a dividend of 3¾ per cent on the 5 per cent cumulative preference shares for the nine months ended 30th June (previous year the same), and 1s 10d per share on the 5s ordinary shares (previous year 2s 5d). In addition the Directors have decided to declare an interim dividend of 1¼ per cent on the preference shares for the three months to 30th September, 1952, and to pay it at the same time as the 3¾ per cent dividend recommended above.

Christy Brothers & Co., Ltd., are making a rights offer of 50,000 £1 ordinary shares at par on the basis of one new share for every four held. The objects of the operation are to liquidate the bank overdraft and to improve working capital.

Liquidations

T. A. Knight, Ltd., ironmongers and electrical contractors.—Winding up voluntarily. Joint liquidators, Mr. W. P. Barnfield, Barclays Bank Chambers, The Bridge, Walsall, and Mr. R. F. Bendall, 126, Colmore Row, Birmingham, 3, appointed 21st October.

Petronic, Ltd., manufacturers of aircraft electrical equipment.—Winding up voluntarily. Liquidator, Mr. G. F. Webb, 7, Great Winchester Street, London, E.C.2, appointed 29th October.

Taylor's of Carshalton, Ltd.—Winding up voluntarily. Liquidator, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2, appointed 13th October.

Bankruptcies

J. Cooper, residing at 15, Rectory Lane, and lately carrying on business at Market Place, both in Orford, Suffolk, mechanical and electrical engineer.—Application for discharge to be heard on 10th December at the Shire Hall, St. Helen's Street, Ipswich.

S. E. Jones and **G. W. A. E. Short,** carrying on business at Elsecar, near Barnsley, Yorks, under the style of S. E. Jones & Co., as dry battery manufacturers.—Last day for receiving proofs for dividend 12th November. Trustee, Mr. J. B. G. Moore, 55, Queen Street, Sheffield, 1, Official Receiver.

A. J. Martin, residing at 202, Putney Bridge Road, Putney, London, and lately carrying on business at High Street, Stalham, Norfolk, electrical engineer and wireless dealer.—Last day for receiving proofs for dividend 12th November. Trustee, Mr. F. R. D. Walter, Castle Chambers, Opie Street, Norwich, Official Receiver.

L. J. Quick, carrying on business at 2, The Mall, Ealing, W.5, electrical distributor.—First meeting to-day (Friday) at 3, Central Buildings, Matthew Parker Street, Westminster, S.W.1. Public examination 9th January at the Court House, Half Acre, Brentford.

C. A. Whittington, carrying on business at 400, Abbeydale Road, Sheffield, electrician and wireless dealer.—Application for discharge to be heard on 7th November at the County Court Hall, 56, Bank Street, Sheffield.

E. J. R. Tremlett, 941, Wimborne Road, Moordown, Bournemouth, radio and electrical dealer.—Trustee, Mr. C. S. Dawson, Woolwich Chambers, Fir Vale Road, Bournemouth, appointed 28th October.

H. R. Aarons, lately carrying on business as Radio Co. (Wholesalers), Leyton, at 764, Lea Bridge Road, London, E.17, and at 35, Tallack Road, Leyton, E.10.—Trustee, Mr. B. Phillips, 76, New Cavendish Street, London, W.1, released 18th July, 1952.

H. Cooke, 16, Marlborough Road, Salisbury, Wilts, formerly carrying on business as Western Wireless, at 33, Fisherton Street, Salisbury, wireless and electrical engineer.—Receiving order dated 3rd July, 1936, rescinded. Order of adjudication made 3rd July, 1936, annulled, and petition filed 3rd July, 1936, dismissed, debts having been paid in full, together with 4 per cent interest.

STOCKS and SHARES

BEFORE the announcement of the heavy issue of £120 million (£60 million for cash) of Transport 4 per cent stock, redeemable 1972–1977, the tendency in the Stock Exchange had been slightly in favour of gilt-edged securities at the expense of industrials. The former derived their main encouragement from the strength of sterling in exchange rates, while industrial shares have been unsettled by such matters as were raised recently by prospects for the motor industry. Although, however, the tone in the industrial markets is distinctly dull, prices do not change a great deal. General Electrics, indeed, are 2s to the good at 42s 6d, and falls in the list of electrical equipment shares seldom exceed a few pence. Overseas telephone shares developed some activity, Orientals rising by half-a-crown and Telephone Properties by 2s. East African Power are understandably on the weak side.

Tube Investments

The final dividend and the preliminary profits statement for the year ended last August are expected any day now from Tube Investments. They are awaited this time with particular interest in view of distributions earlier in the year of an increased interim dividend and a 100 per cent ordinary share bonus. The bonus shares will participate in the coming final payment. For some years previously it has been the company's practice to pay a total of 25 per cent on the ordinary, divided equally between interim and final dividends. From this year's interim of 13½ per cent the market concluded that it was safe to expect a total dividend of not less than 27 per cent, or half that rate on the doubled capital. The £1 shares have been steady at around 55s 9d in anticipation of the event. At that price, the yield, on a total of 13½ per cent dividend, would still be well under 5 per cent.

Crabtree Electrical Results

The final dividend of 10 per cent declared by Crabtree Electrical Industries brings the total up to the same rate of 17½ per cent as that paid since well before the war. In declaring an increased interim dividend early in the year, the company advised shareholders that the purpose was merely to make a more even distribution between this and the final dividend. A measure of disappointment was, nevertheless, apparent in the market after publication of the results, the price of the 10s shares being marked down by 1s 6d to 32s 6d. According to the preliminary figures, the profits for the latest period are appreciably below last year's, but at £114,000, after tax, they still cover twice the amount required to pay the ordinary share dividend. The yield of £5 7s 8d per cent on the shares testifies to their high investment ranking.

W. H. Allen Dealings

A popular reception was given last week to the market introduction of W. H. Allen, Sons & Co.'s £1 ordinary shares. Dealings began at 41s to 41s 6d. The price rose quickly to 43s 6d before settling down at about 42s 9d. As noted here last week, the directors expect to be able to maintain the dividend at the rate of 15 per cent paid for the past six years, although the capital now ranking has been substantially increased, to over a million shares, by the capital bonus of a month ago. On that basis, the indicated yield on the shares is about 7 per cent.

The Allen "Placing"

The W. H. Allen shares were issued through the medium of a "placing" in the Stock Exchange. The placing price was 40s 6d. Seven firms of jobbers were allocated shares which they were to sell at rising prices, in accordance with the demand as this came along. The Stock Exchange doors open for business at 9.30 a.m. Soon after 9 o'clock, brokers and authorized clerks were assembling outside the doors, waiting for these to open, and for the dealings in Allen shares to start. At 9.30, there was a rush towards the various firms of dealers, and it was a case of first come first served with the lowest priced shares. As one jobber finished his line at, say, 41s 6d, he advanced the price of the next lot of shares he had to sell. As the price rose, so some of the speculators who got in earlier were able to sell at a quick profit, which certain of them did, and thereby enabled the market to become more liquid. As a system this "placing" has its obvious defects, but it is occasionally used as an alternative to the issue of shares through a prospectus, which also has various disadvantages compared with the "placing" process.

H. J. Baldwin Capital

In his review circulated with the annual accounts, the chairman of H. J. Baldwin & Co. reports that arrangements have been made for the issue of a further 100,000 6 per cent preference shares when market conditions are favourable. Approval was given nearly a year ago to the necessary increase in authorized capital, a further 500,000 ordinary shares being created as well, for later use if required. Need for new finance is apparent in the balance sheet published last week, which reflects the strain on cash resources resulting from a much expanded scale of operations: turnover in 1951–52 was 50 per cent above the previous year's record figure. Net group profits at £25,000, after tax, rose in roughly the same proportion. At a price of 4s, the 2s shares give 10 per cent on the money, the dividend for the year being 20 per cent.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 3rd Nov. 1952	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	84½	+½	3	11	0
Brit. Elec. 1974/77	3	3	83	—	3	12	3
Brit. Elec. 1976/79	3½	3½	89½	+½	3	18	3
Brit. Elec. 1974/79	—	4½	100	—	4	5	0
Calcutta Elec. ..	6†	6†	20 6	—	5	17	1†
East African Power	7	7	22 6	—1/6	6	4	5
Nigerian Elec. ..	10	10	21 3	—		—	
Palestine Elec. "A"	5†	Nil	12 6	—		—	
Perak Hydro-Elec.	Nil	Nil	14 -	—1/-		Nil	
Equipment and Manufacturing							
AberdareCables(5/-)	20	20	14 -	+6d	7	2	10
Aerialite (1/-) ..	83½	88½	8 3	—	10	14	2
Aron Elec. Ord. ..	15	15	33 9	—	8	17	9
Assoc. Elec. Ord..	20	20	72 6	—	5	10	6
Automatic Tel. & El.	15	15	56 3	—	5	6	8
Babcock & Wilcox	18	18	68 9xd	—	5	2	10
Baldwin, H. J. (2/-)	25	20	4 -xd	—	10	0	0
Bakelite (10/-) ..	—	—	17 6	—		—	
British Aluminium	10	12	43 6	—6d	5	10	4
B.I. Callender's ..	7½	9	33 -	+6d	5	9	1
British Thermostat (5/-)	30	30	27/-	—	5	11	1
British Vac.Cleaner (5/-)	25	25	13 -	—	9	12	4
Brook Motors (10/-)	20	20	28 9	—	6	19	2
Brush Ord. (5/-) ..	10	10	5 -	—	10	0	0
A. F. Bulgin (1/-)..	27½	30	2 6	—	12	0	0
Burco (5/-) ..	42½	38¾	21 3	—	9	2	3
Chloride El. Storage	15	15	61 3	—	4	18	0
Cole, E. K. (5/-) ..	25	25*	15 6	—3d	8	1	4
Cossor, A. C. (5/-)	Nil	10	8 6	—	5	17	8
Crabtree (10/-) ..	17½	17½	32 6	—1 6d	5	7	8
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	9/-	—	6	5	0
De La Rue (5/-) ..	50	35*	10 -	—		—	
Decca (1/-)	112½	112½	17 -	—6d	6	12	3
Dewhurst (2/-) ..	35	22½*	1 6	—		—	
DictographTel.(2/-)	20	20	4 9	—	8	8	6
E.M.I. (10/-) ..	8	12	14 6xd	—	8	5	6
Electrical Components (5/-) ..	20	20	10 -	—	10	0	0
Elec. Construction	15	15	50 -	—	6	0	0
Enfield Cable Ord.	7½	7½	22 6	—1/6	6	13	4
English Electric ..	15	15	55 6	—	5	8	1
Ericsson Tel. (5/-)	22†	22*†	49 -	—	2	12	6†
Ever Ready (5/-)..	35	35	26 6xd	—	6	12	1
Falk Stadelmann	15	15	38 9	+9d	7	14	8
G.E.C. Ord. ..	22½	22½	42 6	+2/-	5	6	0*
General Cables (5/-)	30	30	14 6	—	10	6	10
Greenwood & Batley	15	15	37 -	—	8	2	2
Hackbridge Cable (5/-)	20	20	11 3	—	8	17	10
Hackbridge Hewittic (5/-)	18	20	16 3	—	6	3	0
Hall Tel. Acc. (10/-)	10	10	10/6	—	9	10	6
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (5/-) ..	20	20	17 9	—	5	12	8
Holophane (5/-) ..	15	20*	11 3	—	8	17	10
Hoover (5/-) ..	37½	35*	22 6	—	7	15	6
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	20	25	22 9	—3d	5	10	0
Johnson & Phillips	15	15	52 6	—9d	5	14	3
Lancashire Dynamo	22½	12½*	42 6	—	5	17	8
Laurence,Scott(5/-)	12½	15	12 9	—	5	17	8
London Elec. Wire	10	12½	48 9xd	—	5	2	6
J. Lucas	17½	7½*	34 6	—6d	4	7	0
Marryat & S. (2/-)	22½	22½	5 -	—	9	0	0
Mather & Platt ..	12½	12½	42 6	—	5	17	8
Metal Industries ..	10	15	39/3	—9d		—	
Mid. Elec. Mfg. ..	15	15	53/9	—	5	11	6
Murex	12½	15	53 9	+3d	5	11	7
Newman Ind. (2/-)	6	10	2 3	—	8	17	10
Oldham & Son (1/-)	30	35	2 6	—		—	
Parnall (Yate) (5/-)	6	6	4 3	—	7	1	3
Parsons, C. A. ..	15	10*	53/9	—		—	
Plessey (5/-) ..	20	22½	19 6	—3d	5	15	5
Pye Deferred (5/-)	18	18	15/3	—	5	18	0
Revo (10/-) ..	27½	27½	40/-	—	6	17	6
Reyrolle	15	19*	47 6	—		—	
Scot. Cable (1/-) ..	30	32	11/3	—		—	
Siemens Ord. ..	10	10	34/-	—	5	17	8
Strand Elec. (5/-)..	17½	17½	8/9	—	10	0	0
Sturtevant (5/-) ..	16½†	17½*†	25/-	—		—	
Switchgear&Cowans (5/-)	22½	22½	14 6	—	7	15	2
Taylor T. (5/-) ..	20	20	20 -	—	5	0	0
T.C.C. (10/-) ..	20	20*	37 6	—		—	
T.C. & M... ..	10	10	26 -	—		—	
TelephoneMfg.(5/-)	10	10	8 -	—		—	
Thorn Elec. (5/-)..	10	12½	8 6	—	7	7	0
Tube Investments	25	25	55 9	—		—	
Vactric (5/-) ..	Nil	Nil	3 9	—		Nil	
Veritys (5/-) ..	Nil	7½	4 9	—	7	18	0
Walsall Conduits (4/-)	70	70	45/-	—		—	
Ward & Goldstone (5/-)	45	45*	32 6	—		—	
Watford (2/-) ..	25	25	6 3	—	8	0	0
Westinghouse Brake	14	14	47 9	—1/6d	5	17	3
West, Allen (5/-)..	12½	15	10 3	—	7	6	4
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord.	—	6	86½	—	6	18	9
Ord.	—	3¾	55	—	6	16	3
Anglo-Portuguese	8	8	21 -	+3d	7	12	4
Brit.Elec.Traction: Def. Ord. ..	22½	25	135xd	—	5	15	0
Cable & Wireless: Ord.	6	8	12 4	—	6	9	1
4% Loan ..	4	4	97½	+½	4	2	0
Calcutta Trams ..	6†	6†	21/-	—1/-	5	14	3†
Cape Elec. Trams	4	5	12/-	—	8	6	8
Marconi Marine ..	10	10	31/-xd	—	6	9	0
Oriental Tel. Ord.	16	16	58 9d	+½		—	
Telephone Props...	8	8	34 6	+2/-	4	12	9
Tele. Rentals (5/-)	10	10	9/-	+3d	5	11	1

* After capital bonus.
† Dividends are paid free of Income Tax.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Domestic Food Mixer

TO meet the demand for a low-priced electric food mixer, HOWARD FOSS, LTD., Belvidere Works, Totton, Hants, are now marketing a model without the usual attachments and bowl. The appliance is supplied with two mixing paddles and a wall bracket (as illustrated) and fitted with 6ft of cable. After use the paddles are easily removed for cleaning purposes.

Fibre gears are used to provide a silent fixed speed of 800 r.p.m. (approx.) and it is claimed that the mixer is powerful enough to deal with even heavy cake mixture.

The mixer is normally fitted with a 200/250 V universal motor but other voltages can be arranged for by special order. It is guaranteed for twelve months and the price, including beaters and wall bracket, is £7 10s plus £3 15s purchase tax in the United Kingdom.

Watertight Pendant Switches

A rubber-covered watertight pendant push-button switch has just been brought out by ASEA ELECTRIC, LTD., Fulborne Road, London, E.17, for use as a controller for hoist blocks, cranes, etc., operating out-of-doors or in wet or corrosive atmospheres.

The main body of the switch is entirely of rubber except for an inset metal ring for fixing to the handle; this carries the buttons in an aluminium frame which is also covered with rubber. The switch mechanism is sealed behind a flexible rubber diaphragm. Single motor or two motor reversing switches are available with double-pole contacts able to handle the full current of squirrel cage motors up to 2 h.p. on 400 V three-phase mains or contactor coils of the largest size.

Water Heater

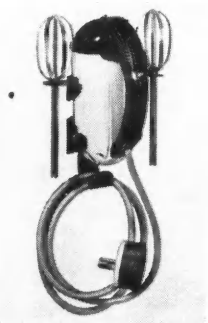
The "Gem" water heater made by RODWAY JONES & Co., 36, Station Road, Westcliff-on-Sea, is now being fitted with a re-settable cut-out, which comes into operation automatically.

Simplified Lampholder

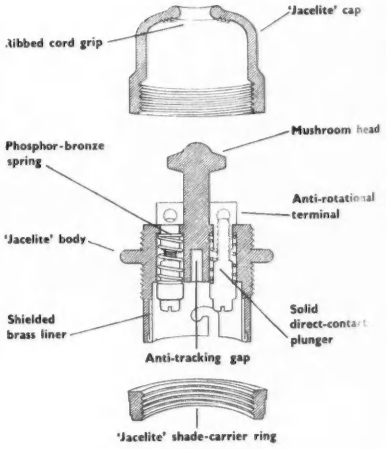
An improved type of plunger-terminal which J. A. CRABTREE & Co., LTD., Lincoln Works, Walsall, are now incorporating in their "Lincoln" lampholders is so designed that the turned brass plunger screws directly into the terminal, so eliminating the usual small terminal screw. The plunger-terminal thus ensures direct electrical continuity from the flexible to the plunger tip without the use of intermediate

1.

2.



3.



(1) Asea watertight pendant switch

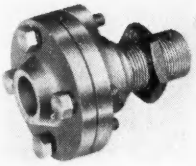
(2) Howard Foss domestic food mixer

(3) "Lincoln" lampholder sectioned to show the plunger-terminal

components, the spring being used only to give the plunger a retractive action. The innovation will considerably simplify and speed up wiring.

Flameproof Glands

Two new cable glands suitable for pliable wire armoured cable have been added to the range of



Left: **G.E.C. flameproof cable gland**

Right: **B.N.E. "C.51" cooker**

flameproof accessories manufactured by the General Electric Co., Ltd., Magnet House, London, W.C.2. They have been certified for use with Group I gases.

Low-priced Cabinet Type Cooker

Designed to meet the demand for a high quality but low-priced cooker, the new model "C.51" unit introduced by British National Electrics, Ltd., Newarthill, Motherwell, possesses an oven of over 2,600 cu in and an appearance generally associated with the more expensive types. Many of the refinements of the company's "C.49" model are incorporated.

The cooker, which is 36in high (excluding splashplate), 21in wide and 21in deep, is of the rectangular flush-to-floor type, with a plinth base. The exterior is finished in two-tone ivory, the inside being mottled grey. Either a two- or three-plate hob can be provided and these are readily interchangeable. The oven,

which is thermostatically controlled, has a cast side-opening door (with provision for a thermostat, if required) and a removable side covering the two banks of 900 W plug-in elements. The drop-down door of the hotcupboard, which measures 6¾in by 17in by 17¾in, has its handle at the side.

With solid plates and three-heat switching the cooker costs £25 10s for the two-plate model and £28 16s for the three-plate model. Radiant plates, simmering control and built-in fuses can be supplied as extras.

Diesel Electric Locos for Rhodesia

THE Rhodesian Railways recently placed an order with the English Electric Co., Ltd., for 23 main line diesel electric locomotives to operate on their 3ft 6in gauge main line between Salisbury and Umtali. This section, which is 170 miles in length, includes severe curvature and gradients as steep as 1 in 40, over which a single locomotive unit will haul trains weighing up to 850 tons.

The locomotives, which are to be built at the company's Preston works, will have the 1 Co-Co 1 wheel arrangement and will weigh 113 tons in working order, of which 90 tons will be available for adhesion. Each locomotive will be powered by a sixteen cylinder V type supercharged diesel engine normally rated at 2,000 b.h.p., 850 r.p.m., but derated for site conditions to 1,710 b.h.p. at 850 r.p.m. The starting tractive effort (at 30 per cent adhesion) will be 60,000 lb and the continuous tractive effort will be 36,000 lb at 13·5 m.p.h. The locomotives are equipped for multiple unit operation although existing traffic requirements can be met by single unit operation. Straight air braking is provided on the locomotives which are also equipped with vacuum exhausters for actuation of train brakes.

Iron and Steel Companies

We have received from the Iron and Steel Corporation of Great Britain a revised statutory list of publicly-owned iron and steel companies and their subsidiaries. It supersedes the list published in February, 1951, and can be obtained (price 1s 6d) from the Corporation at 1, Chester Street, London, S.W.1.

NEXT WEEK'S EVENTS

Monday, 10th November

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Inhibited Transformer Oil," by W. R. Stoker and C. N. Thompson. "The Stability of Oil in Transformers," by P. W. L. Gossling and L. H. Welch.

LIVERPOOL.—Exchange Hotel, 6.30 for 7 p.m. I.E.E. Mersey and North Wales Centre. Annual dinner.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. "The Teaching of Illumination Engineering," opened by S. S. Beggs.

St. Ermin's Hotel, Caxton Street, S.W.1, 6.45 p.m. A.S.E.E. Central London Branch. "Recent Developments in Fluorescent Lighting," by Dr. H. H. Ballin.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "Voltage Transformers and Current Transformers Associated with Switchgear," by W. Gray and A. Wright.

SHEFFIELD.—Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. President's Address, "Smoke Abatement," by Prof. R. J. Sarjant.

The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "The Application of Modern Flash Discharge Tubes," by C. R. Bicknell.

Tuesday, 11th November

BELFAST.—Presbyterian Hostel, Howard Street, 6.15 p.m. I.E.E. Northern Ireland Centre. "Some Recent Developments in Phototelegraphy and Facsimile Transmission," by J. Bell and J. A. B. Davidson and E. T. A. Phillips.

BOLTON.—Balmoral Hotel, Bradshawgate, 7.30 p.m. A.S.E.E. Bolton Branch. "Organization," by D. V. Burling.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. Address by the Chairman of the Radio Section, Dr. E. C. S. Megaw.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Economic Plant Sizes and Boiler-Set Groupings on the British Grid," by B. Donkin and P. H. Margen.

LEEDS.—Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. "Economics of Low-Voltage Electricity Supplies to New Housing Estates," by F. G. Copland.

LONDON.—Café Royal. I.E.E. Measurements Section. Section dinner.

At the Institution of Electrical Engineers, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "Subscriber Trunk Dialling," by D. A. Barron.

At the Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. Three short papers on Factory Lighting.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilization Group. Informal discussion, "The Protection of Industrial Installations—A Case for Argument."

NEWPORT.—Tredegar Arms Hotel, 7 p.m. Newport and District Electric Club. "The Intelligent Use of Electricity for Space Heating," by J. L. Ryecroft.

RUGBY.—B.T.H. Works, 7.30 p.m. I.E.E. Rugby Students' Section. Senior Members' Paper, by J. Moir.

Wednesday, 12th November

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North Scotland Sub-Centre. "Technical Colleges and Education for the Electrical Industry," by H. L. Haslegrave.

BIRMINGHAM.—James Watt Institute, 6.45 p.m. I.E.E. South Midland Students' Section. "Some Technical Problems in Broadcasting," by Dr. K. R. Sturley.

BLACKBURN.—Demonstration Theatre, Darwen Street, 7 p.m. I.E.E. North Lancashire Sub-Centre. "A Logical Approach to the Problems of Electric Space-Warming," by D. H. Parry.

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. Lecture by E. Sheard.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "The Design of High-Speed Salient-Pole A.C. Generators for Water-Power Plants," by E. M. Johnson and C. P. Holder.

FARNBOROUGH.—R.A.E. College, 7.30 p.m. I.E.E. Southern Centre. "Radio Controlled Models," by F. A. Cummins.

HERSHAM.—I.E.E. London Students' Section, 2.30 p.m. Visit to Hackbridge & Hewittic Electric Co., Ltd.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. "Radio Telemetering," by E. D. Whitehead and J. Walsh.

Connaught Rooms, W.C.2. Institute of Transport. Anniversary luncheon.

OXFORD.—37, George Street, 7 p.m. I.E.E. district meeting. "275-kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

Thursday, 13th November

DUNDEE.—Royal Hotel, 7 p.m. I.E.E. North Scotland Sub-Centre. "Technical Colleges and Education for the Electrical Industry," by H. L. Haslegrave.

GLASGOW.—Engineering Centre, 6.45 p.m. Association of Mining Electrical and Mechanical Engineers, West of Scotland Branch. Principal Electrical Inspector's Report.

KETTERING.—George Hotel, 7.30 p.m. I.E.E. East Midland Centre. "Electrical Engineering in the Steel Tube Industry," by H. E. Knight.

LIVERPOOL.—Electricity Showroom, Whitechapel, 7 p.m. E.P.E.A. Merseyside Technical Group. "Power Station Layout," by S. D. Whetman.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Extra meeting. "A 150-kV X-ray Equipment for the Radiography of Circumferential Welds in Gas-Turbine Rotors," by F. W. Waterton.

At British Institute of Management, Hill Street, W.1, 7.30 p.m. Institute of Industrial Supervisors, London Central Section. "Cable and Wireless Communications throughout the World," by Col. H. J. Wellingham.

SWANSEA.—Central Public Library, 6 p.m. I.E.E. West Wales Sub-Centre. "Economics of Low-Voltage Electricity Supplies to New Housing Estates," by F. G. Copland.

Friday, 14th November

CREWE.—Royal Hotel, Nantwich Road, 7.30 p.m. A.S.E.E. Crewe Branch. "Factory Installation Practice," by C. Maddocks.

DUNDEE.—Incorporated Plant Engineers, Dundee Branch. Annual dinner.

LEEDS.—Queens Hotel, 7.30 p.m. I.E.E. North Midland Centre. Annual dinner.

LONDON.—Grosvenor House, Park Lane, W.1. E.I.B.A. Ball.

Victoria Halls, Bloomsbury Square, W.C.1, 7.30 p.m. I.E.E. London Students' Section. Autumn dance.

Caxton Hall, Westminster, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "Site Testing and Servicing of Polyphase Metering Equipment," by D. Nuttall.

SALTBURN.—Zetland Hotel, I.E.E. Tees-side Sub-Centre. 7 for 7.30 p.m. Annual dinner.

STONE.—P.O. Central Training School, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "Electronic Telephone Exchanges," by T. H. Flowers.

Saturday, 15th November

LONDON.—I.E.E. London Students' Section. 10.30 a.m. Visit to Royal Opera House, Covent Garden.

Saturday, 15th November—Saturday, 22nd November

LONDON.—Earls Court. Cycle and Motor Cycle Show.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 17th December from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1947

21963. Heinemann Electric Co.—Trip-free electric circuit breaker. 8th August, 1947. (684311.)

33132. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Circuits embodying cathode-ray tubes. 16th December, 1947. (684552.)

1948

10773. Philips Electrical, Ltd., Pressel, O., and Diepstraten, G. A. M.—Vacuum vessels incorporating ball bearings or roller bearings. 19th April, 1948. Addition to 538289. (684556.)

18845. Statter & Co., Ltd., and Marston, G. S.—Means for winding toroidal coils. 13th July, 1949. (681472.)

29214. Philips Electrical Industries, Ltd., and Klasens H. A.—Electrical condensers. 9th December, 1949. Cognate applications 8912, 1st April, 1949, and 18979. 19th July, 1949. (684474.)

1949

10348. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Circuit arrangements for use in automatic signalling apparatus, for example, in telepnone systems. 19th April, 1949. (684559.)

13403. Philips Electrical, Ltd.—Pulse-modulation communication systems and transmitters and receivers for use therein. 19th May, 1949. Cognate application 13404, 16th July, 1948. (684318.)

13420. McDonald, J.—Electric boilers. 19th May, 1950. (684479.)

14153. General Electric Co., Ltd., Holliday, J. H., and Machin, C. F.—Mercury arc rectifiers. 26th May, 1950. (684480.)

21442. National Research Development Corporation.—Electromechanical transducers. 14th September, 1950. (684486.)

22246. Heinemann Electric Co.—Electric circuit breakers. 8th August, 1947. Divided out of 684311. (684327.)

30112. Hockley Chemical Co., Ltd., and Williams, C. H. J.—Electroplating apparatus. 24th November, 1950. (684333.)

30960. Revo Electric Co., Ltd., and Felton, A. E.—Safety device in an electric-switch mechanism. 4th December, 1950. (684408.)

31610. National Research Development Corporation.—Control of electric servomotors. 5th February, 1951. (684191.)

1950

1155. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 9th January, 1951. (684413.)

2107. General Electric Co., Ltd., and Curtis, P. B.—High-frequency electric heating apparatus. 30th January, 1951. (684495.)

3122. Schwarz, B.—Speed and voltage control of stator fed a.c. commutator motors and frequency convertors. 1st February, 1951. (684415.)

3747. British Thomson-Houston Co., Ltd., and Oldham, T. J. F.—Starting and synchronizing of electric machines. 13th February, 1951. (684416.)

5573. Brush Development Co.—Focused electromechanical transducing device. 6th March, 1950. (684418.)

6133. Thorn Electrical Industries, Ltd.—Fluorescent materials. 5th March, 1951. (684568.)

6761. Electric & Musical Industries, Ltd.—Frequency-modulated radio transmitters. 16th March, 1951. (684250.)

6922. Marconi's Wireless Telegraph Co., Ltd.—Radio communication systems. 31st January, 1951. (684500.)

6986. Welwyn Electrical Laboratories, Ltd., and Browning, J.—Electrical resistors and conductors. 21st March, 1950. (684501.)

8113. English Electric Co., Ltd.—Electro-responsive devices arranged for mounting in a casing. 2nd April. 1951. (684579.)

8750. Metropolitan-Vickers Electrical Co., Ltd.—Electric heaters. 7th February, 1951. (684253.)

8762. Philips Electrical Industries, Ltd.—Electron-beam tubes. 6th April, 1950. (684580.)

9374. British National Electrics, Ltd., and Gollins, H. J.—Electrical heating elements. 17th April, 1951. (684262.)

10518. British Thomson-Houston Co., Ltd.—Testing machine for magnetic materials. 28th April, 1950. (684424.)

11668. Seroma Engineering Co., Ltd.—Electrical air current heaters, more particularly hair dryers. 7th March, 1951. (684341.)

12573. Dunlop Rubber Co., Ltd.—Apparatus for electrically heating aqueous dispersions of rubber. 9th April, 1951. (684264.)

12646. Laurence, Scott & Electromotors, Ltd., and Langham, E. M. Speed control system for a.c. commutator motors. 8th May, 1951. (684507.)

12905. Harley, M. C.—Illuminating devices for aircraft and other vehicles. 22nd August, 1951. (684345.)

13013. English Electric Co., Ltd.—Electric motor control systems. 24th May, 1951. Cognate application 6653, 20th March, 1951. (684426.)

13036. Evans Electroselenium, Ltd., and Collins, G. C.—Spectrophotometers. 24th May, 1951. (684508.)

13597. Ross, F. A.—Electric heaters. 31st May, 1951. (684266.)

14475. British Jeffrey-Diamond, Ltd., Pearson, D., and Carter, H. J.—Electrical flameproof plug-and-socket connectors. 8th May, 1951. (684271.)

16550. Associated Electrical Industries, Ltd.—Calculating apparatus. 24th May, 1951. (684512.)

18294. Standard Telephones & Cables, Ltd.—Magnetrons. 21st July, 1950. (684182.)

18613. Donandt, H.—Slidable armature electric motor. 25th July, 1950. (684516.)

18665. Philips Electrical Industries, Ltd.—Electric circuits comprising a cathode-ray tube. 26th July, 1950. (684583.)

18795. British Thomson-Houston Co., Ltd.—Hydraulic operating systems for ironing machines. 27th July, 1950. (684517.)

19764. Dorman & Smith, Ltd.—Casings of small electric circuit breakers. 13th July, 1951. (684431.)

20812. Spodig, H.—Magnetic filtration systems. 23rd August, 1950. (684052.)

20857. Communications Patents, Ltd.—Transductor arrangements. 23rd November, 1951. (684184.)

21334. Le Tourneau, Inc., R. G.—Slip ring and brush holder arrangements for electric machines. 29th August, 1950. (683979.)

21457. Edison Swan Electric Co., Ltd., Wilman, D., and Reynolds, H. E.—Lanterns for street lighting. 29th August, 1951. (684186.)

22257. Ferranti, Ltd., and McCallum, D. M.—Servo systems. 11th September, 1950. Divided out of 683889. (683924.)

22877. Radio Corporation of America.—Signal clipping circuits, particularly for use in television receivers. 18th September, 1950. (684190.)

23006. General Electric Co., Ltd., and Falconer, J. M.—Aerial systems. 19th September, 1951. (683982.)

23594. Southern United Telephone Cables, Ltd.—Electric cables and conductors of the coaxial type suitable for the transmission of communications. 26th September, 1951. (684192.)

23762. Air-Maze Corporation.—Electrostatic precipitation. 28th September, 1950. (684194.)

23935. General Electric Co., Ltd., and Friedlander, E. S.—Converting systems for converting a.c. to d.c. or vice versa. 26th September, 1951. (684281.)

23943. Greenwood's & Airvac Ventilating Co., Ltd., and Hughes, B. D.—Conduit system for electrical cables. 1st October, 1951. (684361.)

23948. Linde Air Products Co.—Constant-potential submerged metal-arc welding. 29th September, 1950. (684195.)

24022. Smoot, C. H.—Electric control system. 2nd October, 1950. (684523.)

25181. General Electric Co., Ltd., and Smith, R.—High-frequency electric heating apparatus. 7th September, 1951. (684282.)

25047. Soc. Genevoise d'Instruments de Physique.—Installation for the measurement by photo-electric means of the position of a line of a graduation. 25th October, 1950. (684435.)

26249. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Cathode-ray tubes and circuits therefor. 16th December, 1947. Divided out of 684552. (684574.)

27300. Igranic Electric Co., Ltd.—Electronic control systems. 8th November, 1950. (684438.)

28043. Research Corporation.—System for energizing electrical precipitators. 16th November, 1950. (684368.)

29126. Siemens & Halske Akt.-Ges.—Semi-conductor amplifiers. 28th November, 1950. (684285.)

30431 & 30447. Hunt, Ltd., A. H.—Manufacture of capacitors. 10th September, 1951. (684529 & 684443.)

30895. British Thomson-Houston Co., Ltd.—Lighting fixtures. 19th December, 1950. (684287.)

31382. British Thomson-Houston Co., Ltd.—Core structures for electromagnetic induction apparatus. 27th December, 1950. (684286.)

1951

31. National Cash Register Co.—Electronic calculating machines. 1st January, 1951. (684147.)

1079. British Thomson-Houston Co., Ltd.—Ward-Leonard motor speed regulation systems. 15th January, 1951. (684530.)

1194. Philips Electrical Industries, Ltd. Circuit arrangements for charging a capacitor. 16th January, 1951. Addition to 676,465. (684450.)

1208. Telefonaktiebolaget L. M. Ericsson.—Telephone systems. 16th January, 1951. (684531.)

5893. Standard Telephones & Cables, Ltd.—Attenuating devices for electromagnetic waveguide systems. 12th May, 1951. (684453.)

5929. Porsche Konstruktionen Ges.—Electric single wheel drive for road vehicles. 12th March, 1951. (684454.)

8807. Research Corporation.—Electro-magnetic rapping devices and systems. 16th April, 1951. (684066.)

10406. Soc. Francaise de l'Electroresistance.—Potentiometers. 3rd May, 1951. (684067.)

11040. Svenska Aktiebolaget Gas-Accumulator.—Reflector systems for radar purposes. 11th May, 1951. (684300.)

11810. British Thomson-Houston Co., Ltd.—Thermo-electric devices and silver alloys therefor. 21st May, 1951. (684201.)

11631. Philips Electrical Industries, Ltd.—Time-multiplex pulse-code modulation signal-transmission systems. 20th June, 1951. (684387.)

11725. Steatit-Magnesia Akt.-Ges.—Electrical resistances. 21st June, 1951. (684547.)

15021. British Thomson-Houston Co., Ltd.—Motor-switch assemblies. 25th June, 1951. (684075.)

15962. Philips Electrical Industries, Ltd.—Superheterodyne radio receivers. 5th July, 1951. Addition to 668238. (683939.)

16061. Westinghouse Electric International Co.—Control systems for electric-motor driven compressors. 6th July, 1951. (684304.)

16740. Heinemann Electric Co.—Trip-free electric circuit breaker. 8th August, 1947. Divided out of 684311. (684390.)

16818. Multiplex Development Corporation.—Multiplex radio communications systems. 16th July, 1951. (684307.)

17063. British Thomson-Houston Co., Ltd.—Cathodes for electric-discharge apparatus. 18th July, 1951. (683940.)

17511. Standard Telephones & Cables, Ltd.—Radio direction finding systems with remote indication. 24th July, 1951. (684077.)

17521. United States Steel Co.—Electrolytic tin plating baths. 24th July, 1951. (684468.)

19256. British Thomson-Houston Co., Ltd.—Luminaires. 15th August, 1951. (684078.)

19989. Western Electric Co., Inc.—Magnetic recorders, particularly for storing signals in telephone systems. 24th August, 1951. (684079.)

21747. Fernseh Ges.—Electron-discharge tube apparatus. 17th September, 1951. (684080.)

21998. Korsgaard, L. C. J.—Implements for ascertaining whether a wire is under electric tension. 19th September, 1951. (683997.)

22061. Research Corporation.—Apparatus for the electrical precipitation of suspended particles from gases. 20th September, 1951. (684226.)

22151. Westinghouse Electric International Co.—Constant load-voltage electric circuits. 21st September, 1951. (683998.)

23824. Philips Electrical Industries, Ltd.—Circuit arrangements comprising a plurality of amplifiers. 12th October, 1951. (684909.)

28151. Standard Telephones & Cables, Ltd.—A.c. measuring devices. 30th November, 1951. Addition to 672099. (684665.)

1952

12600. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Cathode-ray tubes. 16th December, 1947. Divided out of 684,552. (684590.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 29th November:—

BURROUGHS (design). No. B687,597. BURROUGHS. No. 687,600. Both Class 7. Electric motors for use with office machinery.—Burroughs Adding Machine, Ltd., Avon House, 356–366, Oxford Street, London, W.1.

TELEKING (design). No. 707,359. Class 9. Radio and television receivers, and component parts thereof included in Class 9.—Teleking Corporation, New York, U.S.A. Address for service, c/o Matthews, Haddan & Co., 31 & 32, Bedford Street, Strand, London, W.C.2.

MERTHENE. No. 710,251. Class 9. Electric cables.—Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool.

SWORDFISH. No. 710,369. Class 9. Radio apparatus and parts thereof included in Class 9.—Rees Mace Marine, Ltd., 11, Hinde Street, London, W.1.

NATALEX. No. 708,679. Class 17. Electrical insulating material.—Nathan & Allen, Ltd., 131, Victoria Street, London, S.W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—Brisbane.—21st January. State Electricity Commission of Queensland. Tubular aluminium busbar and accessories. (C.R.E. 36266/52. Ten/5018.)*

Brazil. — Porto Alegre. — 14th November. Diretoria Administrativa da Comissao Estadual de Comptras, Secretaria das Obras Publicas. Equipment for police radio control. (C.R.E. 36802/52. Ten/5020.)* 2nd December. Departamento Estadual Deportas Rios e Canais. Two 200 kW mercury arc rectifiers with transformer, switchboard and accessories. (C.R.E. 36782/52. Ten/5027.)*

Carmarthenshire.—26th November. County Council. Pedestrian crossing beacon globe assemblies. (See this issue.)

London. — Stepney. — 28th November. Borough Council. Lifts, lightning conductors, etc., for blocks at Sydney Street housing scheme. Sydney Clough, Son & Partners, 39, Devonshire Street, W.1.

Middlesbrough. — Education Committee. Electrical installation at Marton Grove Schools. Director of education, Woodlands Road.

Nuneaton.—24th November. Corporation. Street lighting equipment. (See this issue.)

Pakistan. — Karachi. — 17th November. Karachi Port Trust. Supply of six sets of radio inter-communication equipment. (C.R.E. 36184/52. Ten/5001.)*

Prestwich.—15th November. Corporation. Lighting of pedestrian crossings. (See this issue.)

Sevenoaks.—17th November. U.D.C. Illumination of pedestrian crossings. Surveyor, Council Offices, Argyll Road.

Uruguay. — Montevideo. — 18th November. Ferrocarriles & Tranvias del Estado. Supply of 5,000 insulators for telegraph and telephone lines. (C.R.E. 36464/52. Ten/5021.)*

5th December. Usinas Electricas y Telefonos del Estado. Telephone trunk line. (C.R.E. 36326/52. Ten/5024.)*

20th January. Administracion Nacional de Combustibles, Alcohol y Portland. One 700 kW diesel electric generating set. (C.R.E. 36279/52. Ten/4999.)*

Wakefield.—22nd November. R.D.C. Installation of electricity in 50 houses. Surveyor, 18, St. John's North.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

ORDERS PLACED

Alnwick.—R.D.C. Electrical work for 100 miners' houses, Shillbottle.—J. R. Tweedy.

Durham. — County Education Committee. Electrical installation at new Hebburn Technical College (£10,885).—North of England Engineering & Electrical Co., Ltd. Electrical work at Shildon St. John's C.E. School (£927).—Doves (Darlington), Ltd.

Leamington Spa. — Housing Committee. Electrical installations in 71 pre-war houses at Rushmere estate (£1,218).—Grensells, Ltd. Electrical installations in 109 Council houses, Bury Road (£1,184) and 89 Council houses, various estates (£1,442).—L. W. Hodgkins.

London. — L.C.C. Education Committee. Electrical installations in schools: John Burns School, Battersea (£2,611).—Alexander Hawkins & Sons, Ltd. Virginia School, Bethnal Green (£2,316) and Wilberforce School, Paddington (£2,082).—Norwest Services, Ltd. Heber School, Camberwell (£4,753).—Honor Bros., Ltd. Canterbury Road School, Deptford (£1,809).—W. M. Grant & Co. Monson School, Deptford (£3,894).—F. Lawrence. Christopher Hatton School, Holborn (£1,948).—Holmes & Larkinson. Canonbury School, Islington (£3,590).—Buchanan & Curwen, Ltd. Ashmole School, Lambeth (£1,598).—E. Satterthwaite, Ltd. George Lansbury School, Poplar (£3,656).—L.S.P. Electrical Co. Thomas Fairchild School, Shoreditch (£3,319).—London Electricity Board. Flint Street School, Southwark (£2,304).—Artisans (Electrical), Ltd. Smallwood School, Wandsworth (£4,088).—H. A. Lamb & Sons, Ltd. Earl Rise School, Woolwich (£2,420).—Thorpe & Thorpe, Ltd. and Springwell House School, Battersea (£1,711).—Beasley Electrical Contracting Co.

Kensington. — Borough Council. Electrical installation, Talbot Grove House (£2,012).—G. N. Watts, Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashington.—Technical college for Northumberland E.C.; J. W. Urpeth, builder, Bedlington.

Bedfordshire.—First portion of a North Bedfordshire College (1953-54 programme); county architect, Bedford.

Bedlington.—Pithead baths at Choppington "B" pit; N.C.B. Architects' Department, Ashfield Tower, Gosforth, Northumberland.

Belper (Derbyshire).—Houses (70), Kilburn; R.D.C. surveyor.

Bexley.—Community centre at Falconwood Parade, Welling; borough surveyor, West Lodge, Broadway, Bexleyheath.

Birmingham.—Extensions to Aston Technical College, Ettington Road; J. F. Gregg, town clerk, Council House, 1.

Works extensions; L. W. Newton & Co., Ltd., Thimble Mill Lane.

Brighton.—Houses (400), near Hollingbury golf course; D. J. Howe, borough surveyor, 26-30, King's Road.

Bromley.—Extensions, Good Shepherd R.C. School, Moorside Road; Archard, Worrow & Hardy, architects, 20, Lowndes Strees, S.W.1.

Buckhurst Hill.—Flats and maisonnettes (36), Snakes Lane, Woodford; Tooley & Foster, architects, Midland Bank Chambers.

Buckley.—Houses (26), Bistre site; R. Lloyd Roberts, architect, Duffryn Chambers, Mold.

Cambridge.—Laboratories at Lensfield Road (£1,000,000) for University Authorities; H. Turner & Son, surveyors, 19, Queen Anne's Gate, London, S.W.1.

Chelmsford.—Houses (100), on sites at Great Baddow and Great Waltham; R.D.C. surveyor, Council Offices, New London Road.

Chesterfield.—Infants' school at Brockwell and Storrs Road; borough engineer.

Coseley.—Houses (96), Mount Road site, Lanesfield; J. C. Roper, clerk to U.D.C., Council House, Coseley, Bilston.

Coventry. — Maternity and child welfare centre at Broad Street site; D. E. E. Gibson, city architect, Bull Yard, off Warwick Row.

Block C, Broadgate House; city architect.

Dagenham.—Shops and flats, Dagenham Road; Felhurst Estates Co., Ltd., Thorpes Road, E.6.

Flats (36), Eastern Avenue; borough engineer.

Dartford. — Houses (72), Temple Hill; borough surveyor, Barclays Bank Chambers, High Street.

Doncaster.—Extensions to Doncaster Royal Infirmary; Pite, Son & Fairweather, architects, 6, Queen Annes Gate, London, S.W.1.

First part of technical college (estimated cost £120,000), borough architect.

Dovercourt.—Modern secondary school on site off Hall Lane (£100,000); H. Conolly, Essex county architect, County Hall, Chelmsford.

Dronfield.—Houses (22), Pioneer Health and Housing Society; Mrs. M. Walters, architect, 11, Collegiate Crescent, Sheffield.

Droylsden.—Houses (78), on sites at Sunnyside Road and Moorside Street; F. Bradley, architect to U.D.C., 4, Wood Street, Bolton.

East Sussex.—Schools at Robertsbridge and Willingdon; E. A. Verger, county architect, County Hall, Lewes.

Golborne. — Bungalows at Golborne (30), Culceth (6) and Lowton (12); U.D.C. surveyor.

Halesowen.—Houses (21), Maple Tree Lane, Cradley; A. Basterfield, town clerk, Council House.

Hatfield.—Houses (160); R.D.C. surveyor, St. Albans Road.

Hayes and Harlington.—Dwellings for aged persons (37), Park Farm estate; A. E. Higgins, clerk to U.D.C., Town Hall, Hayes.

Hebburn-on-Tyne.—Houses (276), Monkton Lane-Mill Lane site; U.D.C. surveyor.

Heywood.—Houses (70), Lower Broadfield Farm; borough surveyor.

Loughborough.—New out-patients' department at General Hospital; Vallance & Westwick, architects, White Hart Chambers, Mansfield.

Luton.—College of further education; Norman & Dawbarn, architects, 5, Gower Street, W.C.1.

Houses (116), Westmorland Avenue; borough engineer.

Newcastle-on-Tyne.—First stage of proposed bus depot in Slatyford Lane for the City Council (£207,000); George Bainbridge, builder, 205, Westgate Road, Newcastle.

Northwich.—Health centre between Tabley Street and Leicester Street; U.D.C. surveyor.

Nottingham.—Reconstruction of main ward units at City Hospital; Pite, Son & Fairweather, architects, 6, Queen Anne's Gate, London, S.W.1.

Oswaldtwistle.—Grammar school; Cookson & Gibbs, architects, 34, Derby Street, Ormskirk.

Ottery St. Mary.—Houses (38), Longdogs Lane site; A. R. Lamb, architect to U.D.C., Town Hall.

Ross-on-Wye. — Modernization and conversion works at Alton Street Hospital; Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, 15.

Southampton.—Operating theatre, dining room, etc., at Royal South Hants Hospital, for Regional Hospital Board; Gutteridge & Gutteridge, architects, Westwood Road, Southampton.

Stamford.—Houses (60); Lenton & Partners, Broad Street.

Stockport.—Nangreave Road R.C. School; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Sunderland. — Houses (1,400) on site at Grindon; borough engineer.

Tiverton. — Houses (45), Cotteylands; H. S. W. Stone & Partners, architects, 20, The Crescent, Taunton.

Wednesbury.—Additions and alterations to children's home at Park Corner, Walsall Street; T. H. Evans, clerk to C.C., County Buildings, Stafford.

West Hartlepool.—Houses and flats on the Seaton Lane estate; borough architect, Municipal Buildings.

Weymouth.—Police station (£92,000), for Dorset Standing Joint Committee; C. P. Bruttor, clerk, County Hall, Dorchester.

Woodford. — Flats and maisonnettes (36), Snakes Lane; town clerk, Municipal Offices, High Road, E.18.

Worcestershire. — School, Stourbridge; Jackson & Edmunds, architects, 65, New Street, Birmingham.